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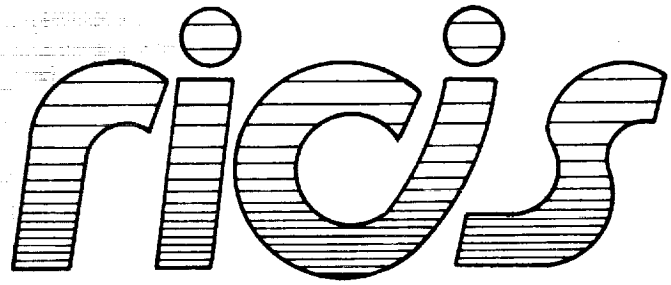
Recreation of the 28-Entity IGES Test File Using the Computervision CADDS 4X

Anchyi Kuan
Saurin Shah
Kevin Smith
University of Houston-Clear Lake

August 1987

Cooperative Agreement NCC 9-16
Research Activity SE.8

NASA Johson Space Center
Engineering Directorate



Research Institute for Computing and Information Systems
University of Houston - Clear Lake

T·E·C·H·N·I·C·A·L R·E·P·O·R·T

The RICIS Concept

The University of Houston-Clear Lake established the Research Institute for Computing and Information systems in 1986 to encourage NASA Johnson Space Center and local industry to actively support research in the computing and information sciences. As part of this endeavor, UH-Clear Lake proposed a partnership with JSC to jointly define and manage an integrated program of research in advanced data processing technology needed for JSC's main missions, including administrative, engineering and science responsibilities. JSC agreed and entered into a three-year cooperative agreement with UH-Clear Lake beginning in May, 1986, to jointly plan and execute such research through RICIS. Additionally, under Cooperative Agreement NCC 9-16, computing and educational facilities are shared by the two institutions to conduct the research.

The mission of RICIS is to conduct, coordinate and disseminate research on computing and information systems among researchers, sponsors and users from UH-Clear Lake, NASA/JSC, and other research organizations. Within UH-Clear Lake, the mission is being implemented through interdisciplinary involvement of faculty and students from each of the four schools: Business, Education, Human Sciences and Humanities, and Natural and Applied Sciences.

Other research organizations are involved via the "gateway" concept. UH-Clear Lake establishes relationships with other universities and research organizations, having common research interests, to provide additional sources of expertise to conduct needed research.

A major role of RICIS is to find the best match of sponsors, researchers and research objectives to advance knowledge in the computing and information sciences. Working jointly with NASA/JSC, RICIS advises on research needs, recommends principals for conducting the research, provides technical and administrative support to coordinate the research, and integrates technical results into the cooperative goals of UH-Clear Lake and NASA/JSC.

Recreation of the 28-Entity IGES Test File Using the Computervision CADDS 4X

Preface

This research was conducted under the auspices of the Research Institute for Computing and Information Systems by Anchyi Kuan, Saurin Shah, and Kevin Smith. Rick Graves, of Barrios Technology, served as Principle Investigator and Sharon Perkins, Associate Professor of Computer Science, at the University of Houston-Clear Lake, served as the RICIS technical representative.

Funding has been provided by the Engineering Directorate, NASA/JSC through Cooperative Agreement NCC 9-16 between NASA Johnson Space Center and the University of Houston-Clear Lake. The NASA technical monitor for this activity was Dave Howes, Information Systems Manager, Engineering Directorate, NASA/JSC.

The views and conclusions contained in this report are those of the author and should not be interpreted as representative of the official policies, either express or implied, of NASA or the United States Government.

RECREATION OF THE 28-ENTITY IGES TEST FILE USING THE COMPUTERVISION CADDS 4X

Prepared by :

Anchyi Kuan
Saurin Shah
Kevin Smith

In Support of :

CTEC 5939
CAD Systems Analysis
Summer Semester 1987

With Supervision from :

Rick Graves
Dr. Sharon Perkins

INTRODUCTION

An Initial Graphics Exchange Specification (IGES)test file created at the GODDARD Space Flight Center (GSFC) is called the 28 Entity IGES Test File. This file contains 28 geometric and annotation entities which are considered the basic entities that an IGES translator for any CAD system should support.

The purpose of this investigation was to determine how the IGES preprocessor supports the 28 entities through recreation of the 28 Entity IGES Test File on the ComputerVision (hereinafter referred to as CV) CADDS 4X.

TEST PROCEDURE

Our investigation followed the following steps which were documented in a GSFC memorandum dated 12 December 1985 (a copy of this memorandum is provided as Attachment 1) :

1. Based on the information in the listing of the geometric characteristics of all the entities that make up the 28 Entity IGES Test File and using the CAD System's user interface, the test file should be recreated in the native format of the CAD System.

2. A record should be kept as to what geometries were used in the CAD System to create the entities in the 28 entity test file and entities not supported by the CAD System should be noted.

3. Produce a hardcopy of the recreated 28 entity test file as it displays in the CAD System.

4. Output the recreated 28 entity test file in IGES format.

5. Read the output IGES file back into the system and produce a hardcopy of the display.

TEST RESULTS

The following discussion summarizes our investigative activitieswhich supported the test procedure as presented in the previous sectionofthis report. This discussion is partitioned into numbered segmentswhich coincide with the 5 steps which make up the test procedure.

1. The 28 Entity IGES Test File was recreated in the native format of the CV CADDS. All geometries and annotations were first created in the given non-rotated orientation (Figure 1). They were then rotated 30 degrees clockwise about the Z, Y, and X axes, respectively, to generate the desired final file (Figure

2). All dimension, flag note and general label entities are created throughthe useof acorrespondingnon-associatedgeometric entity. After creation, these geometric entities are no longer required and are deleted. For example, a circle is required in order to create a Diameter Dimension Entity (see Attachment 2).

For completeness, hardcopies of the non-rotated file (Figure 3) and the rotated file (Figure 4) are included as attachments.

2. Individual descriptions detailing the types of geometries usedinthe CV CADDS to recreate the 28 entity IGES TestFile are presented in Attachment 2. Any problems encountered during the recreation of this test file are documented within this discussion. A summary of the IGES entities supported by the CV CADDS is presented in Table 1.

Table 1. IGES Entities Supported by CV PUT IGES

IGES Entity Number	IGES Entity	IGES Form Number	Computervision Entity
100	Circular Arc		Arc/circle
102	Composite Curve		Group (relation with composite entities)
104	Conic Arc		
	Ellipse	1	Ellipse
	Parabola	3	Parabola
106	Copious data		
	Linear path 3-D	12	String
108	Plane	1	Plane (unbounded or infinite only)
110	Line		Line
112	Parametric spline curve		B-spline/group of Cpoles
114	Parametric spline surface		B-spline/group of Spoles
116	Point		Point
118	Ruled surface		Ruled surface
120	Surface of revolution		Surface of revolution
122	Tabulated cylinder		Tabulated cylinder

202	Angular dimension	Angular dimension
206	Diameter dimension	Diameter dimension
208	Flag note	Flag note
	Flag note with leader	Label with Feature Control Symbol as flag
210	General label	Label
212	General note	Text
216	Linear dimension	Linear dimension
218	Ordinate dimension	Ordinate dimension
220	Point dimension	Ordinate dimension
222	Radius dimension	Radius dimension
308	Subfigure definition	Subfigure part file
404	Drawing	Drawing
408	Singular subfigure instance	Subfigure instance
410	View	View

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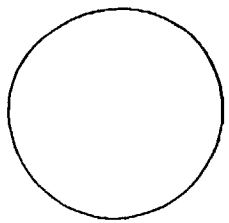
3. Hardcopies of the recreated 28 entity file are presented in Figures 1 and 2. Figure 5 presents CV's drawing defined display of the 28 entity test file. Figure 6 presents NASCAD's drawing defined display of the 28 entity test file, for comparison.

4. The recreated 28 entity test file was pre-processed into IGES neutral format. A copy of the output listing is included as Attachment 3.

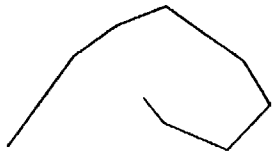
5. The IGES file was then read back into the system. The result is presented in Figure 7.



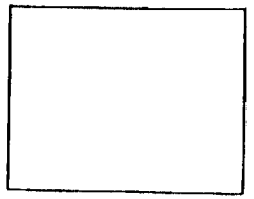
CIRCULAR ARC (100)

COMPOSITE CURVE (102)

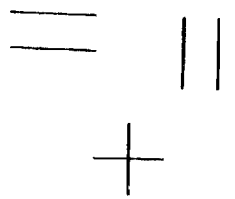
CONIC ARC (104)



LINEAR STRING (106)

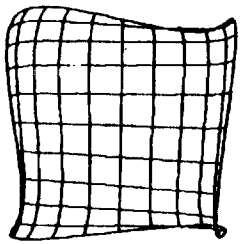


PLANE (108)

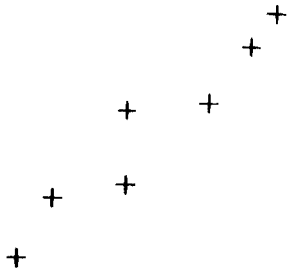


LINE (110)

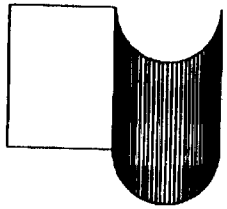
SPLINE (112)



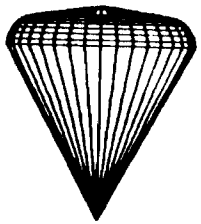
SPLINE SURFACE (114)



POINT (116)



RULED SURFACE (118)



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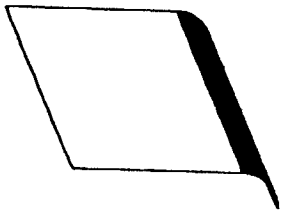
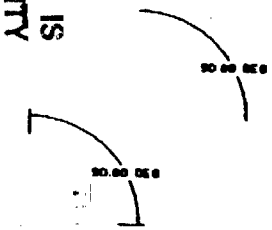


TABULATED CYLINDER (122)



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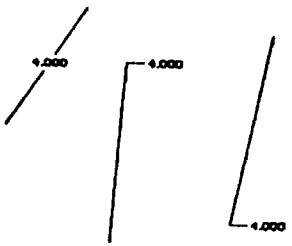
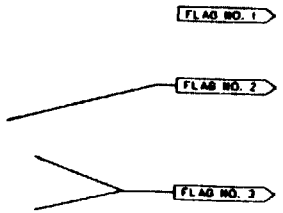


DIAMETER DIMENSION (206)



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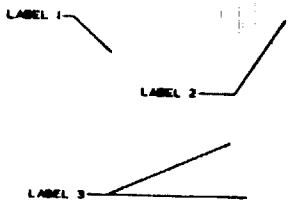

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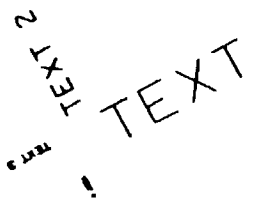

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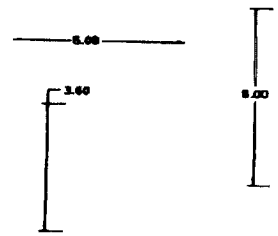

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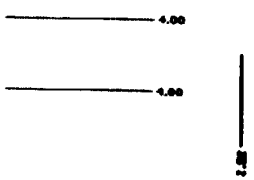

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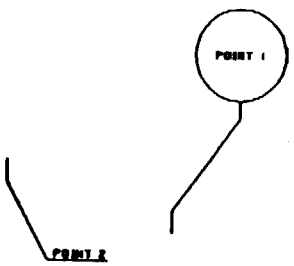

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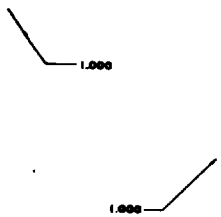


RADIUS DIMENSION (222)

SUBFIGURE
(408)

FIGURE 1

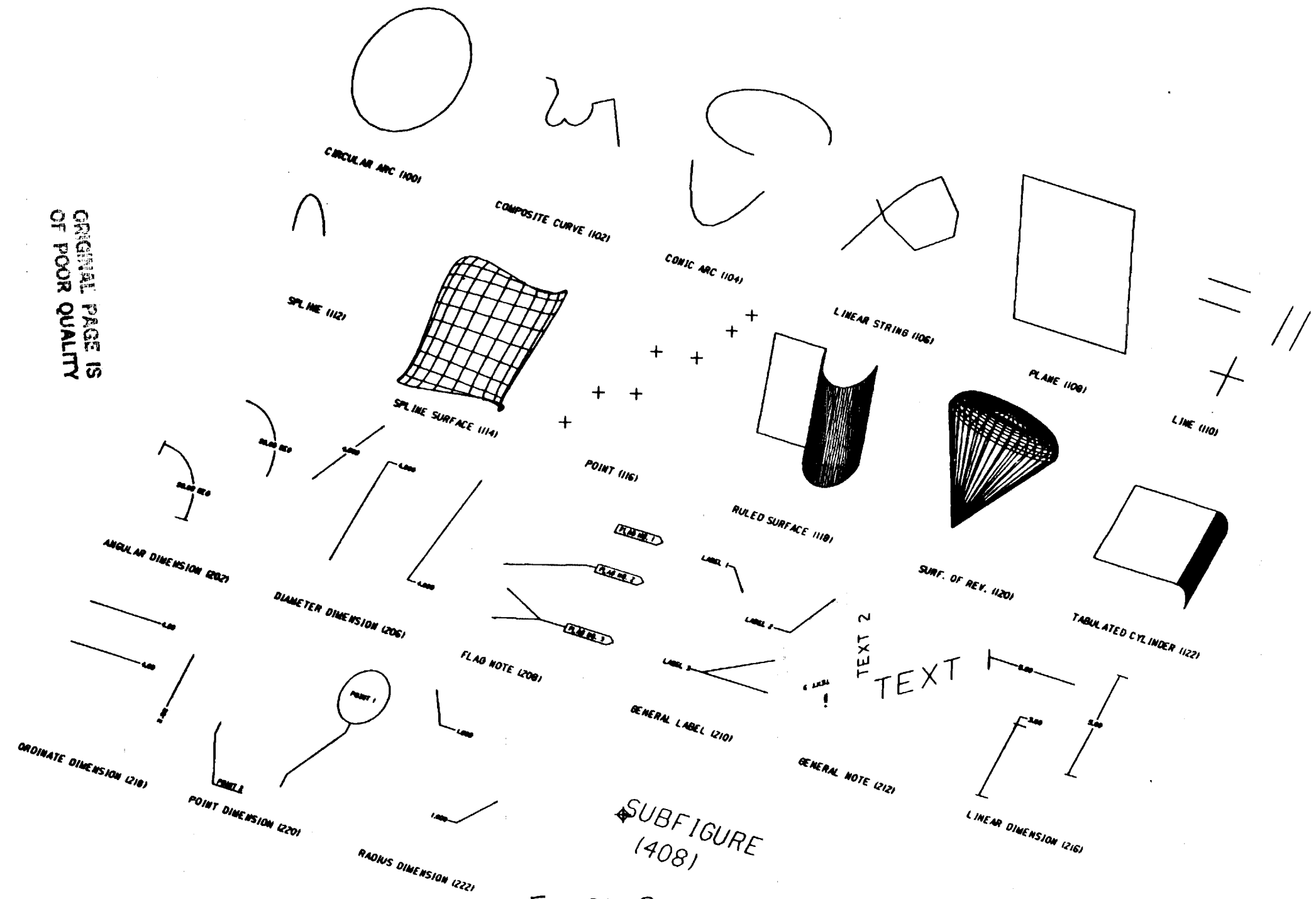
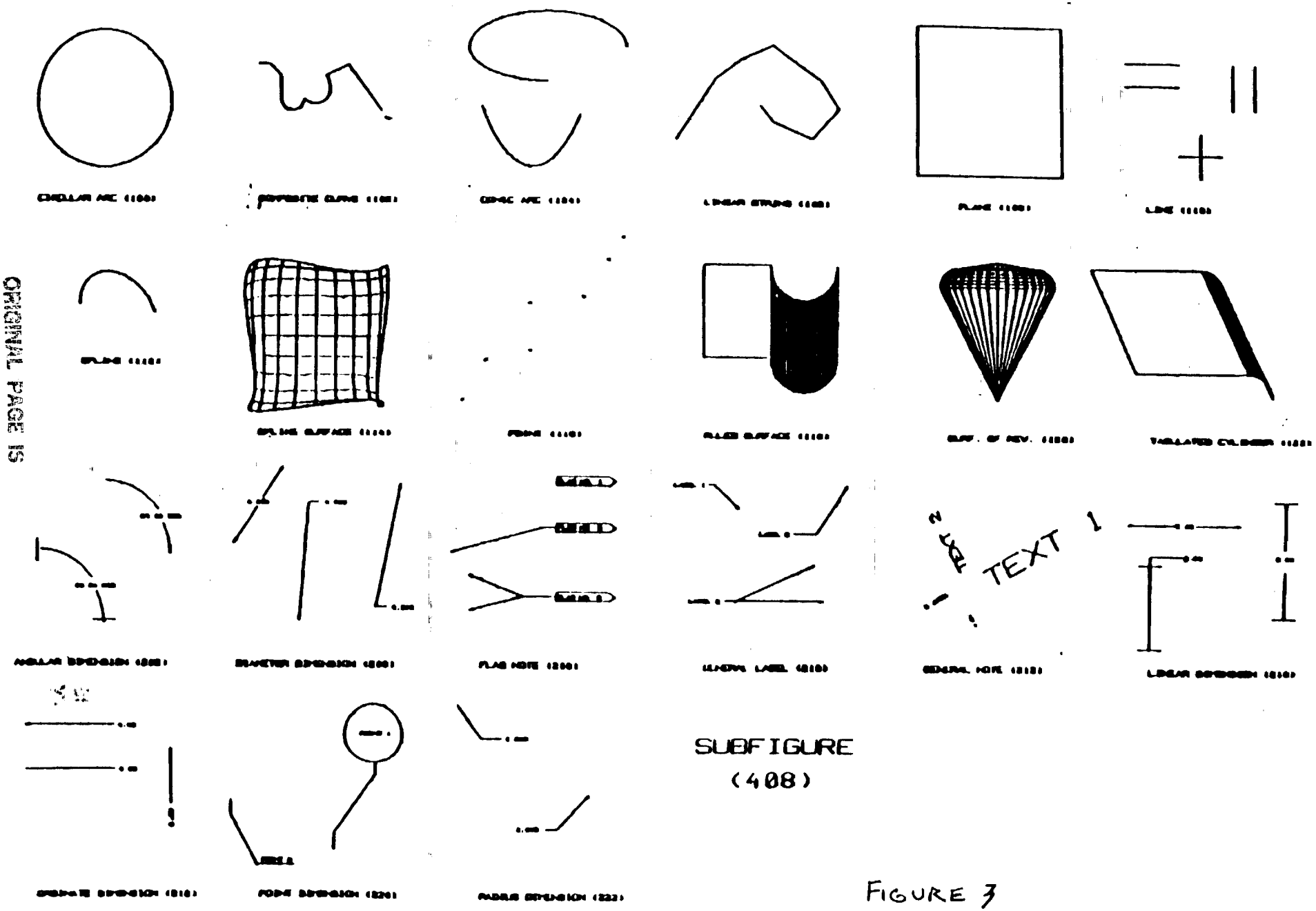


FIGURE 2



SUBFIGURE
(408)

FIGURE 3

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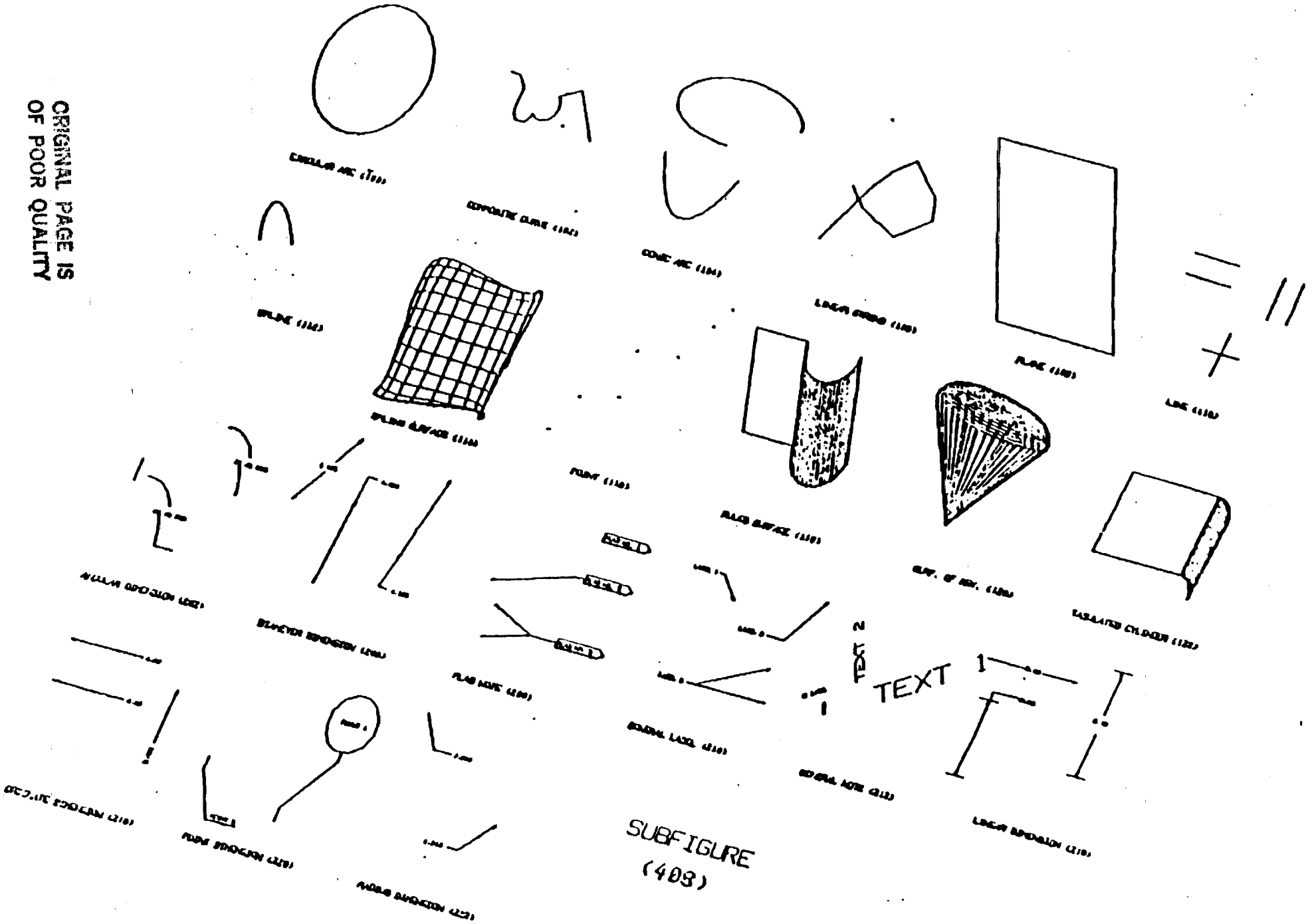
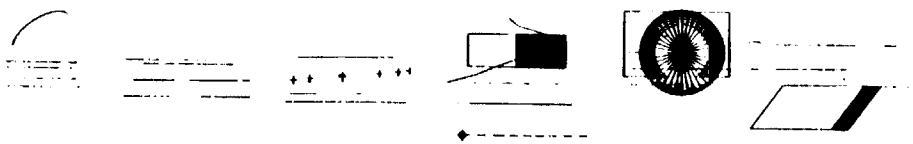
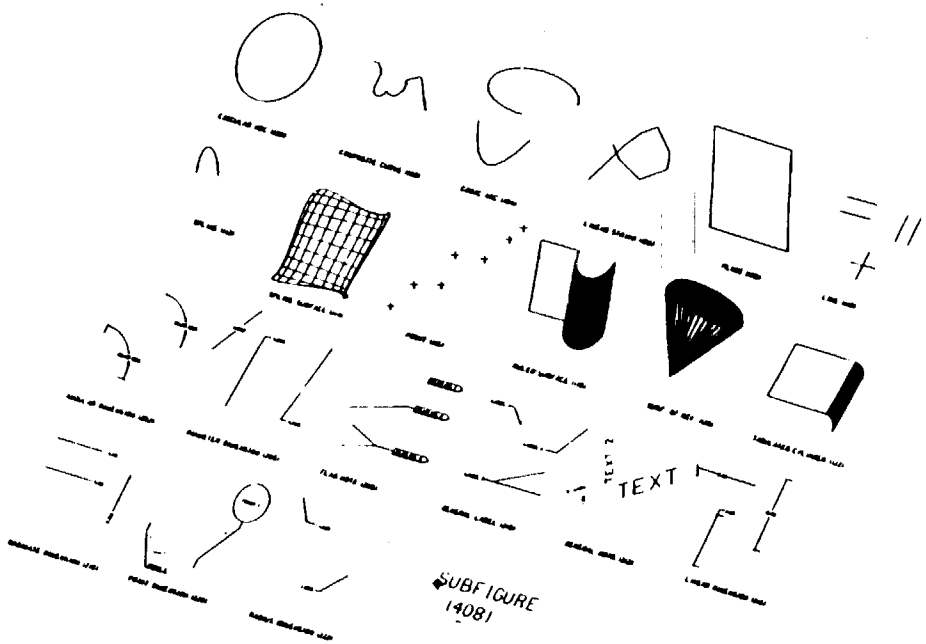


Figure 4





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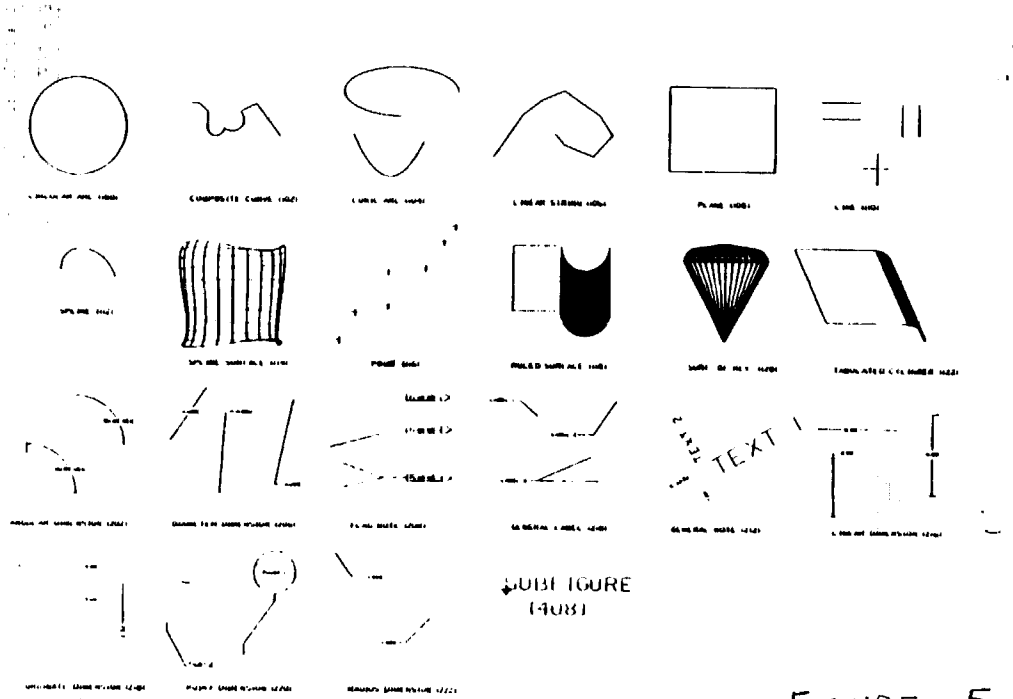
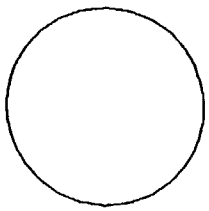


FIGURE 5

FIGURE 6



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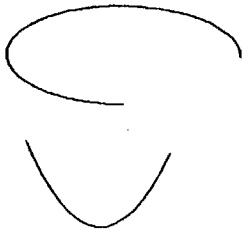
COMPOSITE CURVE (102)



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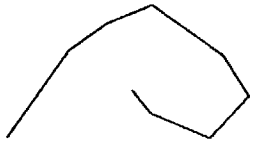

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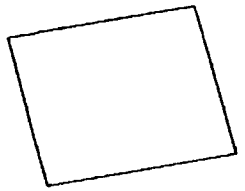
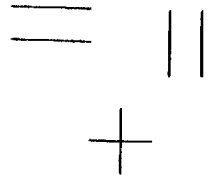
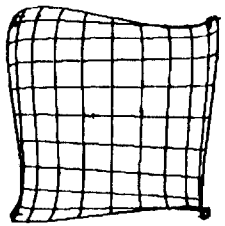


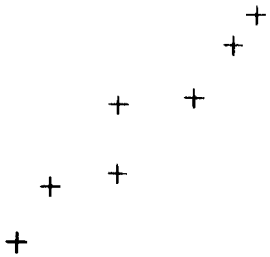
PLANE (108)



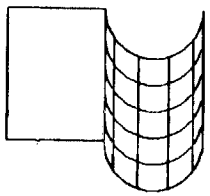
LINE (110)

SPLINE (112)

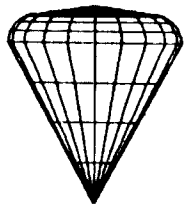




POINT (116)



RULED SURFACE (118)



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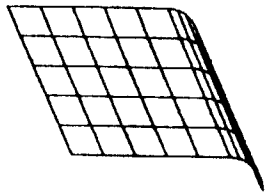
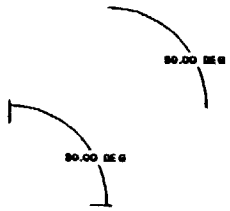


TABULATED CYLINDER (122)



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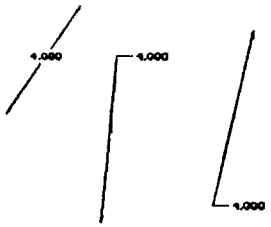
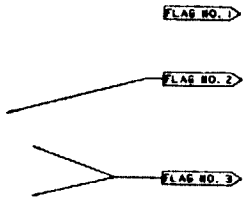


DIAMETER DIMENSION (206)



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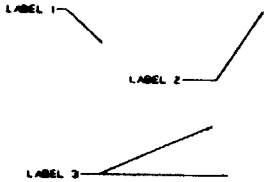

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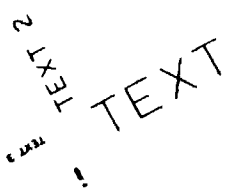

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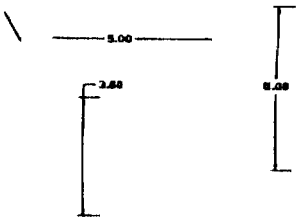

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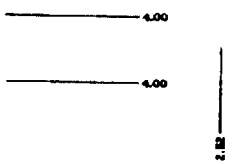
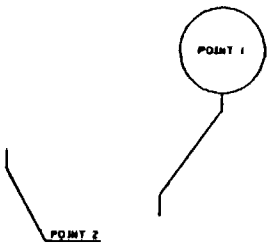
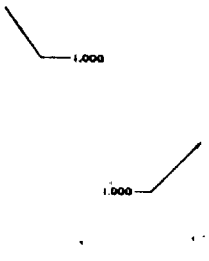


ORDINATE DIMENSION (218)



POINT DIMENSION (220)



RADIUS DIMENSION (222)

SUBFIGURE (408)

ORIGINAL PAGE IS OF POOR QUALITY

FIGURE 7

ATTACHMENT 1

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland
20771

NASA

December 12, 1985

Reply to Attn of 731.4

TO: Distribution

FROM: Engineering Directorate
Applied Engineering Division

SUBJECT: Recreation of 28 Entity Test File

The enclosed listing provices a labeled description of the geometric characteristics of all the entities that make up the 26 Entity Initial Graphics Exchange Specification (IGES) Test File. Each separate entity in the file is identified and the geometric information necessary for a user to recreate that entity in his Computer Aided Design (CAD) System is listed below it. The entities are listed in numerical order based on IGES entity type number.

The geometric information listed for the entities in the file is given for the entities in a non-rotated position. This was done because many of the entities are easier to describe and create in a non-rotated orientation. In creating the final file in your CAD System, all the geometric and annotation entities must be rotated 30 degrees clockwise about the X, Y, and Z axis respectively. This information is also given at the top of the listing along with any characteristic values used in the creation of the file.

In order to perform the second phase of this test, the following steps should be performed:

a. Based on the information in the listing and using the CAD System's user interface, the 28 entity file should be recreated in the native format of the CAD System.

b. A record should be kept as to what geometries were used in the CAD System to create the entities in the 28 entity test file and entities not supported by the CAD System should be noted.

c. Produce a hardcopy of the recreated 28 entity test file as it displays in the CAD System.

d. Output the recreated 28 entity test file in IGES format.

e. Read the output IGES file back into the system and produce a hardcopy of the display.

f. Send all hardcopies of displays, the output IGES file, and the record of how the file was created (step b) to Goddard.

The results of this test should reveal precisely how the 28 IGES entities are supported by the pre-processor independent of the post-processor's ability to read them into the CAD System from the IGES format. These results, along with the information you have supplied identifying how the 28 IGES entities are mapped into the internal formats of the CAD Systems at each of the centers, should allow us to formulate a fairly accurate picture of how the IGES translators support the 28 entities selected for testing.

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Enclosure

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DISCRIPTION OF 28 ENTITY IGES TEST FILE

---------- FILE CHARACTERISTICS ----------

ALL GEOMETRIES LISTED BELOW MUST BE ROTATED:
30 DEGREES ABOUT THE Z AXIS
30 DEGREES ABOUT THE Y AXIS
30 DEGREES ABOUT THE X AXIS

TEXT CHARACTERISTICS (UNLESS OTHERWISE NOTED):
TEXT IS FONT TYPE 1 (STANDARD BLOCK)
GENERAL NOTES HAVE A TEXT HEIGHT OF 0.3
DIMENSION TEXT HAVE A TEXT HEIGHT OF 0.2

ARROWHEAD CHARACTERISTICS (UNLESS OTHERWISE NOTED):
ARROWHEAD LENGTH IS 0.2
ARROWHEAD WIDTH IS 0.025
SOLID ARROWHEAD (FORM 1)

TEXT AND ANNOTATION VISIBLE IN VIEWS 1 AND 4 ONLY

ALL UNITS ARE INCHES UNLESS SPECIFIED

---------- GEOMETRIC INFORMATION ----------

CIRCULAR ARC (100)

ARC				
X Y Z	-22.00	25.00	1.00	START
X Y Z	-25.00	25.00	1.00	CENTER
X Y Z	3.00	0.00	0.00	MAJOR AXIS
X Y Z	0.00	3.00	0.00	MINOR AXIS
X Y Z	-22.00	25.00	1.00	END

GENERAL NOTE (212)

TEXT:	"CIRCULAR ARC (100)"			
X Y Z	-28.00	20.48	0.00	TEXT LOCATION

COMPOSITE CURVE(102)

COMPOSITE CURVE				
LINE 1				
X Y Z	-18.00	26.50	1.00	START
X Y Z	-17.50	26.50	1.00	END
LINE 2				
X Y Z	-17.50	26.50	1.00	START
X Y Z	-17.00	26.00	1.00	END
LINE 3				
X Y Z	-17.00	26.00	1.00	START
X Y Z	-17.00	25.00	1.00	END

ARC 1				
X Y Z	-17.00	25.00	1.00	START
X Y Z	-16.50	25.00	1.00	CENTER
X Y Z	0.50	0.00	0.00	MAJOR AXIS
X Y Z	0.00	0.50	0.00	MINOR AXIS
X Y Z	-16.00	25.00	1.00	END
ARC 2				
X Y Z	-16.00	25.00	1.00	START
X Y Z	-15.50	25.50	1.00	CENTER
X Y Z	0.71	0.00	0.00	MAJOR AXIS
X Y Z	0.00	0.71	0.00	MINOR AXIS
X Y Z	-15.00	26.00	1.00	END
LINE 4				
X Y Z	-15.00	26.00	1.00	START
X Y Z	-14.00	26.50	1.00	END
LINE 5				
X Y Z	-14.00	26.50	1.00	START
X Y Z	-12.50	24.50	1.00	END

GENERAL NOTE (212)

TEXT:	"COMPOSITE CURVE (102)"			
X Y Z	-18.00	20.50	0.00	TEXT LOCATION

CONIC ARC (104)

ELLIPSE (FORM 1)				
X Y Z	-1.44	27.32	1.50	START
X Y Z	-5.00	27.32	1.50	CENTER
X Y Z	3.56	0.00	0.00	MAJOR AXIS
X Y Z	0.00	1.50	0.00	MINOR AXIS
X Y Z	-5.00	25.82	1.50	END

CONIC ARC (104)

PARABOLA (FORM 3)				
X Y Z	-7.98	24.75	1.50	
X Y Z	-5.68	22.11	1.50	
X Y Z	0.00	0.50	0.00	
X Y Z	0.50	0.00	0.00	
X Y Z	-3.55	24.38	1.50	

GENERAL NOTE (212)

TEXT:	"CONIC ARC (104)"			
X Y Z	-8.00	20.50	0.00	

COPIOUS DATA (106)

3-D LINEAR STRING (FORM 12)				
X Y Z	0.70	23.40	0.00	STRING POINT
X Y Z	2.50	26.00	0.50	STRING POINT
X Y Z	3.70	26.90	1.00	STRING POINT

X Y Z	5.10	27.50	1.50	STRING POINT
X Y Z	7.30	26.00	2.00	STRING POINT
X Y Z	8.10	24.80	2.50	STRING POINT
X Y Z	6.90	23.50	3.00	STRING POINT
X Y Z	5.10	24.20	3.50	STRING POINT
X Y Z	4.50	24.90	4.00	STRING POINT

GENERAL NOTE (212)

TEXT:	"LINEAR STRING (106)"			
X Y Z	2.00	20.50	0.00	TEXT LOCATION

PLANE (108)

BOUNDING CURVE				
X Y Z	11.63	21.98	0.00	
X Y Z	18.21	21.98	0.00	
X Y Z	18.21	28.50	5.00	
X Y Z	11.63	28.50	5.00	
X Y Z	11.63	21.98	0.00	
PLANE NORMAL				
X Y Z	11.63	21.98	0.00	START
X Y Z	11.63	54.88	-42.90	END

GENERAL NOTE (212)

TEXT:	"PLANE (108)"			
X Y Z	13.50	20.50	0.00	TEXT LOCATION

LINE (110)

LINE 1				
X Y Z	21.00	27.00	1.00	START
X Y Z	23.50	27.00	1.00	END
LINE 2				
X Y Z	21.00	26.00	1.00	START
X Y Z	23.50	26.00	1.00	END
LINE 3				
X Y Z	26.00	27.00	1.00	START
X Y Z	26.00	25.00	1.00	END
LINE 4				
X Y Z	27.00	27.00	1.00	START
X Y Z	27.00	25.00	1.00	END
LINE 5				
X Y Z	24.50	24.00	1.00	START
X Y Z	24.50	22.00	1.00	END
LINE 6				
X Y Z	23.50	23.00	1.00	START
X Y Z	25.50	23.00	1.00	END

GENERAL NOTE (212)

TEXT:	"LINE (110)"			
X Y Z	22.00	20.50	0.00	TEXT LOCATION

SPLINE (112)

SPLINE POINT 1				
X Y Z	-26.02	16.18	1.92	POSITION VECTOR
DX DY DZ	0.035	0.856	0.518	TANGENT VECTOR
SPLINE POINT 2				
X Y Z	-26.00	16.41	2.06	POSITION VECTOR
DX DY DZ	0.107	0.828	0.549	TANGENT VECTOR
SPLINE POINT 3				
X Y Z	-25.92	16.73	2.29	POSITION VECTOR
DX DY DX	0.288	0.735	0.617	TANGENT VECTOR
SPLINE POINT 4				
X Y Z	-25.83	16.92	2.47	POSITION VECTOR
DX DY DX	0.394	0.658	0.642	TANGENT VECTOR
SPLINE POINT 5				
X Y Z	-25.64	17.15	2.73	POSITION VECTOR
DX DY DX	0.541	0.523	0.662	TANGENT VECTOR
SPLINE POINT 6				
X Y Z	-25.40	17.33	2.99	POSITION VECTOR
DX DY DX	0.664	0.366	0.654	TANGENT VECTOR
SPLINE POINT 7				
X Y Z	-25.21	17.41	3.17	POSITION VECTOR
DX DY DX	0.733	0.250	0.634	TANGENT VECTOR
SPLINE POINT 8				
X Y Z	-24.90	17.48	3.41	POSITION VECTOR
DX DY DX	0.811	0.073	0.583	TANGENT VECTOR
SPLINE POINT 9				
X Y Z	-24.56	17.47	3.63	POSITION VECTOR
DX DY DX	0.856	-0.107	0.509	TANGENT VECTOR
SPLINE POINT 10				
X Y Z	-24.22	17.39	3.81	POSITION VECTOR
DX DY DX	0.867	-0.283	0.414	TANGENT VECTOR
SPLINE POINT 11				
X Y Z	-23.88	17.25	3.96	POSITION VECTOR
DX DY DX	0.843	-0.447	0.303	TANGENT VECTOR
SPLINE POINT 12				
X Y Z	-23.55	17.04	4.05	POSITION VECTOR
DX DY DX	0.786	-0.595	0.180	TANGENT VECTOR

SPLINE POINT 13

X Y Z	-23.25	16.79	4.10	POSITION VECTOR
DX DY DX	0.697	-0.718	0.050	TANGENT VECTOR
SPLINE POINT 14				
X Y Z	-23.00	16.47	4.09	POSITION VECTOR
DX DY DX	0.580	-0.814	-0.083	TANGENT VECTOR
SPLINE POINT 15				
X Y Z	-22.79	16.13	4.04	POSITION VECTOR
DX DY DX	0.440	-0.870	-0.210	TANGENT VECTOR
SPLINE POINT 16				
X Y Z	-22.65	15.78	3.93	POSITION VECTOR
DX DY DX	0.284	-0.918	-0.338	TANGENT VECTOR

GENERAL NOTE (212)

TEXT:	"SPLINE (112)"			
X Y Z	-26.00	13.50	0.00	TEXT LOCATION

SPLINE SURFACE (114)

SPLINE 1				
X Y Z	-18.40	11.78	0.00	POSITION VECTOR
DX DY DZ	2.44	2.83	0.116	TANGENT VECTOR
X Y Z	-18.40	17.78	0.00	POSITION VECTOR
DX DY DZ	2.44	2.83	0.116	TANGENT VECTOR
SPLINE 2				
X Y Z	-12.40	11.78	0.00	POSITION VECTOR
DX DY DZ	-2.44	-2.83	-0.116	TANGENT VECTOR
X Y Z	-12.40	17.78	0.00	POSITION VECTOR
DX DY DZ	-2.44	-2.83	-0.116	TANGENT VECTOR
SPLINE 3				
X Y Z	-18.40	11.78	0.00	POSITION VECTOR
DX DY DZ	-2.44	-2.83	-0.116	TANGENT VECTOR
X Y Z	-12.40	11.78	0.00	POSITION VECTOR
DX DY DZ	-2.44	-2.83	-0.116	TANGENT VECTOR
SPLINE 4				
X Y Z	-18.40	17.78	0.00	POSITION VECTOR
DX DY DZ	2.44	2.83	0.116	TANGENT VECTOR
X Y Z	-12.40	17.78	0.00	POSITION VECTOR
DX DY DZ	2.44	2.83	0.116	TANGENT VECTOR

GENERAL NOTE (212)

TEXT:	"SPLINE SURFACE (114)"		
X Y Z	-18.00	10.50	0.00

POINT (116)

POINT 1			
X Y Z	-8.80	12.10	0.10

POINT 2				
X Y Z	-7.80	13.80	0.20	
POINT 3				
X Y Z	-5.76	14.22	0.30	
POINT 4				
X Y Z	-5.76	16.31	0.40	
POINT 5				
X Y Z	-3.44	16.54	0.50	
POINT 6				
X Y Z	-2.28	18.16	0.60	
POINT 7				
X Y Z	-1.58	19.09	0.70	
	GENERAL NOTE (212)			
TEXT:	"POINT (116)"			
X Y Z	-6.70	10.50	0.00	TEXT LOCATION
	RULED SURFACE (118)			
CURVE 1				
LINE				
X Y Z	2.00	18.00	3.00	START
X Y Z	5.00	18.00	3.00	END
ARC				
X Y Z	5.00	18.00	3.00	START
X Y Z	6.50	18.00	3.00	CENTER
X Y Z	1.50	0.00	0.00	MAJOR AXIS
X Y Z	0.00	1.50	0.00	MINOR AXIS
X Y Z	8.00	18.00	3.00	END
CURVE 2				
LINE				
X Y Z	2.00	14.00	1.00	START
X Y Z	5.00	14.00	1.00	END
ARC				
X Y Z	5.00	14.00	1.00	START
X Y Z	6.50	14.00	1.00	CENTER
X Y Z	1.50	0.00	0.00	MAJOR AXIS
X Y Z	0.00	1.50	0.00	MINOR AXIS
X Y Z	8.00	14.00	1.00	END
	GENERAL NOTE (212)			
TEXT:	"RULED SURFACE (118)"			
X Y Z	2.00	10.50	0.00	TEXT LOCATION
	SURFACE OF REVOLUTION (120)			

DRIVEN CURVE
LINE

X Y Z	15.25	12.25	2.00	START
X Y Z	17.87	17.13	2.00	END

ARC

X Y Z	17.87	17.13	2.00	START
X Y Z	17.00	17.13	2.00	CENTER
X Y Z	0.87	0.00	0.00	MAJOR AXIS
X Y Z	0.00	0.87	0.00	MINOR AXIS
X Y Z	17.00	18.00	2.00	END

LINE

X Y Z	17.00	18.00	2.00	START
X Y Z	15.25	18.25	2.00	END

DRIVE CURVE
ARC

X Y Z	17.87	17.13	2.00	START
X Y Z	15.25	17.13	2.00	CENTER
X Y Z	2.62	0.00	0.00	MAJOR AXIS
X Y Z	0.00	0.00	-2.62	MINOR AXIS
X Y Z	17.87	17.13	2.00	END

GENERAL NOTE (212)

TEXT:	"SURF. OF REV. (120)			
X Y Z	13.00	10.50	0.00	TEXT LOCATION

TABULATED CYLINDER (122)
CURVE 1
ARC

X Y Z	27.50	12.50	0.00	START
X Y Z	26.50	12.50	0.00	CENTER
X Y Z	1.00	0.00	0.00	MAJOR AXIS
X Y Z	0.00	1.00	0.00	MINOR AXIS
X Y Z	26.50	13.50	0.00	END

LINE

X Y Z	26.50	13.50	0.00	START
X Y Z	21.50	13.50	0.00	END

CURVE 2
ARC

X Y Z	25.50	17.00	-2.67	START
X Y Z	24.50	17.00	-2.67	CENTER
X Y Z	1.00	0.00	0.00	MAJOR AXIS
X Y Z	0.00	1.00	0.00	MINOR AXIS
X Y Z	24.50	18.00	-2.67	END

LINE

X Y Z	24.50	18.00	-2.67	START
X Y Z	19.50	18.00	-2.67	END

GENERAL NOTE (212)

TEXT:	"TABULATED CYLINDER (122)"			
X Y Z	22.00	10.50	0.00	TEXT LOCATION

ANGULAR DIMENSION (202)

LEADER 1 (ARC)			
X Y Z	-22.00	5.50	0.65
X Y Z	-25.00	5.50	0.65
X Y Z	3.00	0.00	0.65
X Y Z	0.00	3.00	0.65
X Y Z	-22.29	6.80	0.65
LEADER 2 (ARC)			
X Y Z	-25.00	8.50	0.65
X Y Z	-25.00	5.50	0.65
X Y Z	3.00	0.00	0.65
X Y Z	0.00	-3.00	0.65
X Y Z	-22.53	7.20	0.65
DIMENSION TEXT:	"90.00 DEG"		
X Y Z	-23.30	6.85	0.65

ANGULAR DIMENSION (202)

LEADER 1 (ARC)			
X Y Z	-25.00	2.50	0.65
X Y Z	-28.00	2.50	0.65
X Y Z	3.00	0.00	0.65
X Y Z	0.00	3.00	0.65
X Y Z	-25.29	3.80	0.65
LEADER 2 (ARC)			
X Y Z	-28.00	5.50	0.65
X Y Z	-28.00	2.50	0.65
X Y Z	3.00	0.00	0.65
X Y Z	0.00	-3.00	0.65
X Y Z	-25.53	-4.20	0.65
DIMENSION TEXT:	"90.00 DEG"		
X Y Z	-26.30	3.85	0.65
WITNESS LINE			
X Y Z	-24.50	2.50	0.65
X Y Z	-25.50	2.50	0.65
WITNESS LINE			
X Y Z	-28.00	6.00	0.65
X Y Z	-28.00	5.00	0.65

GENERAL NOTE (212)

TEXT:	"ANGULAR DIMENSION (202)"		
X Y Z	-29.00	0.50	0.00

DIAMETER DIMENSION (205)

LEADER 1				
X Y Z	-19.12	5.85	1.25	LEADER POINT
X Y Z	-18.07	7.40	1.25	LEADER POINT
X Y Z	-18.07	7.40	1.25	LEADER POINT
LEADER 2				
X Y Z	-16.88	9.15	1.25	LEADER POINT
X Y Z	-17.76	7.85	1.25	LEADER POINT
X Y Z	-17.76	7.85	1.25	LEADER POINT
DIMENSION TEXT:	"4.000"			
X Y Z	-18.50	7.50	1.25	TEXT LOCATION

DIAMETER DIMENSION (206)

LEADER 1				
X Y Z	-15.84	6.49	1.25	LEADER POINT
X Y Z	-16.16	2.57	1.25	LEADER POINT
X Y Z	-16.16	2.57	1.25	LEADER POINT
LEADER 2				
X Y Z	-16.16	2.57	1.25	LEADER POINT
X Y Z	-15.75	7.63	1.25	LEADER POINT
X Y Z	-15.75	7.63	1.25	LEADER POINT
X Y Z	-15.25	7.63	1.25	LEADER POINT
DIMENSION TEXT:	"4.000"			
X Y Z	-15.00	7.50	1.25	TEXT LOCATION

DIAMETER DIMENSION (206)

LEADER 1				
X Y Z	-12.43	4.55	1.25	LEADER POINT
X Y Z	-11.57	8.45	1.25	LEADER POINT
X Y Z	-11.57	8.45	1.25	LEADER POINT
LEADER 2				
X Y Z	-11.57	8.45	1.25	LEADER POINT
X Y Z	-12.75	3.13	1.25	LEADER POINT
X Y Z	-12.75	3.13	1.25	LEADER POINT
X Y Z	-12.25	3.13	1.25	LEADER POINT
DIMENSION TEXT:	"4.000"			
X Y Z	-12.00	3.00	1.25	TEXT LOCATION

GENERAL NOTE (212)

TEXT:	"DIAMETER DIMENSION (206)"			
X Y Z	-19.00	0.50	0.00	TEXT LOCATION

FLAG NOTE (208)

DIMENSION TEXT:	"FLAG NO. 1"			
X Y Z	-4.50	8.50	-1.25	TEXT LOCATION

FLAG CURVE

X Y Z	-4.54	8.40	-1.25	FLAG POINT
X Y Z	-2.14	8.40	-1.25	FLAG POINT
X Y Z	-1.85	8.60	-1.25	FLAG POINT
X Y Z	-2.14	8.80	-1.25	FLAG POINT
X Y Z	-4.54	8.80	-1.25	FLAG POINT
X Y Z	-4.54	8.40	-1.25	FLAG POINT

FLAG NOTE (208)

LEADER 1

X Y Z	-9.30	5.50	-1.25	LEADER POINT
X Y Z	-5.10	6.60	-1.25	LEADER POINT
X Y Z	-4.54	6.60	-1.25	LEADER POINT

DIMENSION TEXT: "FLAG NO. 2"

X Y Z	-4.50	6.50	-1.25	TEXT LOCATION

FLAG CURVE

X Y Z	-4.54	6.40	-1.25	FLAG POINT
X Y Z	-2.14	6.40	-1.25	FLAG POINT
X Y Z	-1.85	6.60	-1.25	FLAG POINT
X Y Z	-2.14	6.80	-1.25	FLAG POINT
X Y Z	-4.54	6.80	-1.25	FLAG POINT
X Y Z	-4.54	6.40	-1.25	FLAG POINT

FLAG NOTE (208)

LEADER 1

X Y Z	-8.50	3.00	-1.25	LEADER POINT
X Y Z	-6.00	3.60	-1.25	LEADER POINT
X Y Z	-4.54	3.60	-1.25	LEADER POINT

LEADER 2

X Y Z	-8.50	4.50	-1.25	LEADER POINT
X Y Z	-6.00	3.60	-1.25	LEADER POINT

DIMENSION TEXT: "FLAG NO. 3"

X Y Z	-4.50	3.50	-1.25	TEXT LOCATION

FLAG CURVE

X Y Z	-4.54	3.40	-1.25	FLAG POINT
X Y Z	-2.14	3.40	-1.25	FLAG POINT
X Y Z	-1.85	3.60	-1.25	FLAG POINT
X Y Z	-2.14	3.80	-1.25	FLAG POINT
X Y Z	-4.54	3.80	-1.25	FLAG POINT
X Y Z	-4.54	3.40	-1.25	FLAG POINT

GENERAL NOTE (212)

TEXT: "FLAG NOTE (208)"

X Y Z	-8.00	0.50	0.00	TEXT LOCATION

GENERAL LABEL (210)

LEADER 1

X Y Z	3.60	7.50	-1.25	LEADER POINT
X Y Z	2.50	8.50	-1.25	LEADER POINT
X Y Z	2.20	8.50	-1.25	LEADER POINT

DIMENSION TEXT: "LABEL 1"

X Y Z	0.70	8.40	-1.25	TEXT LOCATION

GENERAL LABEL (210)

LEADER 1

X Y Z	8.50	8.50	-1.25	LEADER POINT
X Y Z	7.10	6.40	-1.25	LEADER POINT
X Y Z	6.10	6.40	-1.25	LEADER POINT

DIMENSION TEXT: "LABEL 2"

X Y Z	4.50	6.30	-1.25	TEXT LOCATION

GENERAL LABEL (210)

LEADER 1

X Y Z	7.50	3.50	-1.25	LEADER POINT
X Y Z	3.00	3.50	-1.25	LEADER POINT

LEADER 2

X Y Z	7.00	5.00	-1.25	LEADER POINT
X Y Z	3.50	3.50	-1.25	LEADER POINT

DIMENSION TEXT: "LABEL 3"

X Y Z	1.40	3.39	-1.25	TEXT LOCATIOIN

GENERAL NOTE (212)

TEXT: "GENERAL LABEL (210)"

X Y Z	2.00	0.50	0.00	TEXT LOCATION

GENERAL NOTE (212)

TEXT: "TEXT 1"

X Y Z	15.00	4.00	1.00	TEXT LOCATION

TEXT SIZE: 1.0

TEXT: "TEXT 2"

X Y Z	14.00	5.00	1.00	TEXT LOCATION

TEXT SIZE: 0.5

TEXT: "TEXT 3"

X Y Z	13.00	4.00	2.00	TEXT LOCATION

TEXT SIZE: 0.2

TEXT: "TEXT 4"

X Y Z	14.00	3.00	3.00	TEXT LOCATION

TEXT SIZE: 0.1

GENERAL NOTE (212)

TEXT: "GENERAL NOTE (212)"

X Y Z	12.00	0.50	0.00	TEXT LOCATION

LINEAR DIMENSION (216)

LEADER 1				
X Y Z	28.01	3.01	2.50	LEADER POINT
X Y Z	28.01	3.21	2.50	LEADER POINT
X Y Z	28.01	5.05	2.50	LEADER POINT
LEADER 2				
X Y Z	28.01	8.01	2.50	LEADER POINT
X Y Z	28.01	7.81	2.50	LEADER POINT
X Y Z	28.01	5.97	2.50	LEADER POINT
DIMENSION TEXT:	"5.00"			
X Y Z	27.60	5.50	2.50	TEXT LOCATION
WITNESS LINE				
X Y Z	28.51	8.01	2.50	START
X Y Z	27.51	8.01	2.50	END
WITNESS LINE				
X Y Z	28.51	3.01	2.50	START
X Y Z	27.51	3.01	2.50	END

LINEAR DIMENSION (216)

LEADER 1				
X Y Z	25.97	6.99	2.50	LEADER POINT
X Y Z	25.77	6.99	2.50	LEADER POINT
X Y Z	24.01	6.99	2.50	LEADER POINT
LEADER 2				
X Y Z	21.00	6.99	2.50	LEADER POINT
X Y Z	21.20	6.99	2.50	LEADER POINT
X Y Z	23.03	6.99	2.50	LEADER POINT
DIMENSION TEXT:	"5.00"			
X Y Z	23.10	6.90	2.50	TEXT LOCATION

LINEAR DIMENSION (216)

LEADER 1				
X Y Z	22.00	1.60	2.50	LEADER POINT
X Y Z	22.00	1.80	2.50	LEADER POINT
X Y Z	22.00	5.60	2.50	LEADER POINT
X Y Z	23.40	5.60	2.50	LEADER POINT
LEADER 2				
X Y Z	22.00	5.20	2.50	LEADER POINT
X Y Z	22.00	5.00	2.50	LEADER POINT
X Y Z	22.00	1.60	2.50	LEADER POINT
DIMENSION TEXT:	"3.60"			
X Y Z	23.50	5.50	2.50	TEXT LOCATION

WITNESS LINE				
X Y Z	22.51	1.60	2.50	START
X Y Z	21.51	1.60	2.50	END
WITNESS LINE				
X Y Z	22.51	5.20	2.50	START
X Y Z	21.51	5.20	2.50	END
GENERAL NOTE (212)				
TEXT:	"LINEAR DIMENSION (216)"			
X Y Z	22.00	0.50	0.00	TEXT LOCATION
ORDINATE DIMENSION (218)				
LEADER 1				
X Y Z	-28.50	-2.00	-0.50	LEADER POINT
X Y Z	-24.50	-2.00	-0.50	LEADER POINT
DIMENSION TEXT:	"4.00"			
X Y Z	-24.30	-2.10	-0.50	TEXT LOCATION
ORDINATE DIMENSION (218)				
LEADER 1 (NO ARROWHEAD)				
X Y Z	-28.50	-4.00	-0.50	LEADER POINT
X Y Z	-24.50	-4.00	-0.50	LEADER POINT
DIMENSION TEXT:	"4.00"			
X Y Z	-24.30	-4.10	-0.50	TEXT LOCATION
ORDINATE DIMENSION (218)				
LEADER 1				
X Y Z	-22.00	-3.00	-0.50	LEADER POINT
X Y Z	-22.00	-5.50	-0.50	LEADER POINT
DIMENSION TEXT:	"2.52"			
X Y Z	-21.90	-6.50	-0.50	TEXT LOCATION
GENERAL NOTE (212)				
TEXT:	"ORDINATE DIMENSION (218)"			
X Y Z	-28.00	-9.50	0.00	TEXT LOCATION
POINT DIMENSION (220)				
LEADER 1 (NO ARROWHEAD)				
X Y Z	-12.70	-3.60	-1.00	LEADER POINT
X Y Z	-12.70	-4.10	-1.00	LEADER POINT
X Y Z	-14.60	-6.70	-1.00	LEADER POINT
X Y Z	-14.60	-7.40	-1.00	LEADER POINT
POINT SYMBOL (ARC)				
X Y Z	-11.50	-2.30	-1.00	START
X Y Z	-12.80	-2.30	-1.00	CENTER

X Y Z	1.30	0.00	0.00	MAJOR AXIS
X Y Z	0.00	1.30	0.00	MINOR AXIS
X Y Z	-11.50	-2.30	-1.00	END

DIMENSION TEXT: "POINT 1"

X Y Z	-13.40	-2.40	-1.00	TEXT LOCATION

POINT DIMENSION (220)

LEADER 1 (NO ARROWHEAD)

X Y Z	-16.40	-8.10	-1.00	LEADER POINT
X Y Z	-18.10	-8.10	-1.00	LEADER POINT
X Y Z	-19.30	-5.90	-1.00	LEADER POINT
X Y Z	-19.30	-5.30	-1.00	LEADER POINT

DIMENSION TEXT: "POINT 2"

X Y Z	-17.90	-8.00	-1.00	TEXT LOCATION

GENERAL NOTE (212)

TEXT: "POINT DIMENSION (220)"

X Y Z	-18.00	-9.50	0.00	TEXT LOCATION

RADIUS DIMENSION (222)

LEADER 1

X Y Z	-8.40	-1.80	-0.75	LEADER POINT
X Y Z	-9.00	-1.00	-0.75	LEADER POINT
X Y Z	-7.90	-2.50	-0.75	LEADER POINT
X Y Z	-7.00	-2.50	-0.75	LEADER POINT

DIMENSION TEXT: "1.000"

X Y Z	-6.80	-2.60	-0.75	TEXT LOCATION

RADIUS DIMENSION (222)

LEADER 1

X Y Z	-3.00	-5.00	-0.75
X Y Z	-4.50	-6.50	-0.75
X Y Z	-5.00	-6.50	-0.75

DIMENSION TEXT: "1.000"

X Y Z	-6.30	-6.60	-0.75

GENERAL NOTE (212)

TEXT: "RADIUS DIMENSION (222)"

X Y Z	-8.00	-9.50	0.00

SUBFIGURE DEFINITION (308)

TEXT 1: SUBFIGURE

X Y Z	0.00	0.00	0.00	TEXT LOCATION

TEXT SIZE: 0.8

TEXT 2: (408)

X Y Z	1.50	-1.50	0.00	TEXT LOCATION

TEXT SIZE: 0.8

DRAWING ENTITY (404)
LOCATION OF VIEW 1 (DRAWING SPACE)
X Y 35.0 35.0

LOCATION OF VIEW 2 (DRAWING SPACE)
X Y 35.0 105.0

LOCATION OF VIEW 3 (DRAWING SPACE)
X Y 105.0 35.0

LOCATION OF VIEW 4 (DRAWING SPACE)
X Y 105.0 105.0

SUBFIGURE INSTANCE (408)
X Y Z 1.69 -3.15 -3.19 SUBFIGURE LOCATION

VIEW ENTITY (410)
VIEW = 1 VIEW WIDTH = 70.00

CENTER OF VIEW (MODEL SPACE)
X Y Z 5.69 14.34 -2.24

VIEW ROTATION (DEGREES CLOCKWISE)
X Y Z 30.00 30.00 30.00

VIEW ENTITY (410)
VIEW = 2 VIEW WIDTH = 88.75

CENTER OF VIEW (MODEL SPACE)
X Y Z 3.19 11.24 -1.61

VIEW ROTATION (DEGREES CLOCKWISE)
X Y Z -76.10 25.66 -33.69

VIEW ENTITY (410)
VIEW = 3 VIEW WIDTH = 100.50

CENTER OF VIEW (MODEL SPACE)
X Y Z 3.19 11.24 -1.61

VIEW ROTATION (DEGREES CLOCKWISE)
X Y Z -19.11 -48.59 40.89

VIEW ENTITY (410)
VIEW = 4 VIEW WIDTH = 88.75

CENTER OF VIEW (MODEL SPACE)
X Y Z 3.19 11.24 -1.61

VIEW ROTATION (DEGREES CLOCKWISE)

X Y Z	0.0	0.0	0.0

ATTACHMENT 2

The following individual descriptions present the CV CADDS entities used to recreate the 28 entity IGES test file. Each heading is in the form : * IGES Entity (number) : CV Entity.

The primary purpose of this appendix is to present the specific CV commands used to recreate the appropriate entities. Additional information on each of these recreations is available through Dr. Sharon Perkins with the University of Houston at Clear Lake. Dr. Perkins is the custodian of the detailed notes and illustrations written/drawn up by the authors of this report during the performance of this investigation. These notes would be of great help to a person interested in the details of the recreation of the 28 entity IGES test file. However, we felt that it would not be appropriate to present these details as part of this report. Dr. Perkins can be reached through the School of Natural and Applied Sciences.

* CIRCULAR ARC (100) : Arc/Circle -

Given : Reference Attachment 1.

CV Implementation :

```
#n#INS CIRCLE RADIUS 3.0 :
MODEL LOC X-25 Y25 Z1 [RETURN]
```

Comments: Well supported.

* COMPOSITE CURVE (102) : Group -

Given : Reference Attachment 1.

CV Implementation :

```
#n#INS LINE  (4 LINES)
#n#INS ARC   (3 ARCS)
#n#CONSTRUCT GROUP : d1 d2 .....
```

Note : The use of dn represents a digitization.

Comments : Supported through Group.

* CONIC ARC (104) ELLIPSE (FORM 1) : Ellipse -

Given : Reference Attachment 1.

CV Implementation :

```
#n#INS ELLIPSE HMAJ 3.56 HMIN 1.5 ANGA 0 ANGB 270 :
Model Loc X-5.0 Y27.32 Z1.5 [RETURN]
```

Comments : Well supported.

* CONIC ARC (104) PARABOLA (FORM 3) : Parabola -

Given : Reference Attachment 1.

CV Implementation :

#n#INS PARABOLA XFOC 0.5 YHI 2.3 YLO -2.13 ROT 90.0 : MODEL LOC X-5.68 Y22.11 Z1.5 [RETURN]

Comments : Well supported.

* COPIOUS DATA (106) 3D LINEAR STRING (FORM 12) : String -

Given : Reference Attachment 1.

CV Implementation :

#n#INS STRING : d1 d2 d3 d4..... [RETURN]

Comments : Well supported.

* PLANE (108) : Plane -

Given : Reference Attachment 1.

CV Implementation :

#n#INS PLANE BOUND 3.275 : Model LocX14.92 Y25.24 Z2.5, X11.63 Y21.98 Z0, X18.21 Y21.98 Z0 [RETURN]

Comments : Only unbounded planes are supported.

* LINE (110) : Line -

Given : Reference Attachment 1.

CV Implementation :

#n#INS LINE : d1 d2 [RETURN]

Comments : Well supported.

* SPLINE (112) : B-spline -

Given : Reference Attachment 1.

CV Implementation :

```
#n#INS BSPLINE DEG 3 TANA TANB : d1d2 d3d4 ;
d5d6d7.....dn [RETURN]
```

Comments : Well supported.

* SPLINE SURFACE (114) : B-spline surface -

Given : Reference Attachment 1.

CV Implementation :

Comments : This was the most complex of the recreations. Therefore it is not practical to attempt a summary of commands here. Please reference the original recreation notes if interested.

* POINT (116) : Point -

Given : Reference Attachment 1.

CV Implementation :

```
#n#INS POINT : Model Loc d1d2....dn [RETURN]
```

Comments : Well supported.

* RULED SURFACE (118) -

Given : Reference Attachment 1.

CV Implementation :

```
#n#INS LINE : Model Loc X2.0 Y18.0 Z3.0,
                        X5.0 Y18.0 Z3.0 [RETURN]
#n#INS LINE : Model Loc X2.0 Y14.0 Z1.0,
                        X5.0 Y14.0 Z1.0 [RETURN]
#n#INS RSURF : Model Ent d1 d2 [RETURN]
(where d1 = digitize line near one of its end,
       d2 = digitize 2nd line near the same end
            as line 1)
#n#INS ARC RADIUS 1.5 : Model Loc d1d2d3 [RETURN]
(whered1 = center of arc,d2 = start and d3= end)
#n#INS RSURF MESH 5X5 : Model Ent d1d2 [RETURN]
```

Comments : Well supported ; two separate rules surfaces are created.

* SURFACE OF REVOLUTION (120) : Surface of Revolution -

Given : Reference Attachment 1.

CV Implementation :

Insert the 3 entities of the Driven Curve,
#n#INS LINE, #n#INS ARC RAD, #n#INS LINE
Then,
#n#INS SREV MESH NXN : Model ent d1d2d3 ;
Model end d4d5 [RETURN]

d1d2d3 = digitize the above 3 entities
d4d5 = digitize or location of 2 end points which define an axis about which the revolution takes places. For our case, d4 = X15.25 Y12.25 Z2.0, and d5 = X15.25 Y18.25 Z2.0.

Comments : Well supported ; three separate surfaces of revolution are created.

* TABULATED CYLINDER (122) : Tabulated Cylinder -

Given : Reference Attachment 1.

CV Implementation :

First insert the Arc and Line of curve 1.
#n#INS ARC RAD : and
#n#INS LINE .
Then,
#n#INS TCYLINDER LOWBND 0.0 HIBND 5.4397
MESH5X5:Modelent d1d2; Modelendd3d4 [RETURN]
d1d2 = digitize arc and line.
d3d4 = 2 endpoints to define the direction of the translation for Tcylinder (vector). For our case,
d3 = X27.5 Y12.5 Z0 = start of arc 1, and
d4 = X25.5 Y17.0 Z-2.67 = start of arc 2.

Comments : Well supported ; two separate tabulated cylinders are created.

* ANGULAR DIMENSION (202) -

Given : Reference Attachment 1.

CV Implementation :

a) Angular dimension without extension lines (witness lines)

#n#INS LINE VERTICAL : Model loc X-25 Y5.5 Z.65, IY3 [RETURN]
#n#INS LINE HORIZONTAL : Model loc X-25 Y5.5 Z.65, IX3 [RETURN]
#n#INS ADIMENSION TEXT MAIN/90.00 DEG/HEIGHT 0.2 LOCATION RADIUS 3.0 SUPRESS EXTENSION BOTH : Model loc X-22.3737 Y6.95 Z0.65 [RETURN]
where : d1 = digitize first line near its upper end

b) Angular dimension with extension lines.

#n#INS LINE VERTICAL : Model loc d1d2 [RETURN]
where : d1 = X-25.5936 Y4.9064 Z0.65,
d2 = X-28 Y2.5 Z0.65

#n#INS LINE HORIZONTAL : Model loc d1d2 [RETURN]
where : d1 = X-25.5936 Y2.5 Z0.65
d2 = X-28 Y2.5 Z0.65

#n#INS ADIMENSION TEXT MAIN/90.0 DEG/HEIGHT 0.2 LOCATION RADIUS 3.0 : Model end d1d2 Model loc X-25.3737 Y3.95 Z0.65 [RETURN]

Comments : Well supported.

* DIAMETER DIMENSION (206) : Diameter dimension -

Given : Reference Attachment 1.

CV Implementation :

a) #n#INS CIRCLE DIAM : Model loc d1d2 [RETURN]
d1d2 = end points of the diameter,
where d1 = X-19.12 Y5.85 Z1.25, and
d2 = X-16.88 Y9.15 Z1.25 .
#n#INS LINE : Model loc d1d2 [RETURN]
#n#INS LINE HORIZONTAL : Model loc (digitize 2 points)
#n#INS DDIMENSION TEXT MAIN /4.000/HEIGHT 0.2 : Model entity d (digitize circle at d1) ; Modelloc Int of d1d2 (digitize the two lines) [RETURN]
Then delete the circle and the two lines.

b) #n#INS CIRCLE DIAM : d1d2 [RETURN]
d1d2 = start of header 1 and header 2,
where d1 = X-15.84 Y6.49 Z1.25, and
d2 = X-16.16 2.57 Z1.25
#n#INS DDIMENSION TEXT MAIN /4.000/HEIGHT 0.2

LEADER HEAD : Model ent d1 (digitize circle)
Model loc d2d3 (digitize the required headers)
where d2 = X-15.75 Y7.62 Z1.25,
and d3 = X-15.25 Y7.62 Z1.25.

c) #n#INS CIRCLE DIAM : d1d2 [RETURN]
d1d2 = start of headers,
where d1 = X-11.57 Y8.45 Z1.25,
and d2 = X-12.43 Y4.55 Z1.25.
#n#INS DDIM TEXT MAIN /4.000/HEIGHT 0.2 LEADER HEAD : Model ent d1 (digitize circle anywhere)
Model loc d2d3 [RETURN]
where d2 = X-12.75 Y3.13 Z1.25, and
d3 = X-12.25 Y3.13 Z1.25

Comments : Well supported.

* FLAG NOTE (208) : Flag/Label -

Given : Reference Attachment 1.

CV Implementation :

a) #n#INS FLAG / FLAG NO. 1 / HEIGHT 0.2 : Model loc d1 [RETURN]
where d1 = X-4.54 Y8.4 Z-1.25

b) #n#INS POINT : Model loc X-9.3 Y5.5 Z-1.25 [RETURN]
#n#INS LABEL /[B5] FLAG NO. 2 [X]/ HEIGHT 0.2 : Model ent d1 Model loc d2d3 [RETURN]
where d1 = digitize point,d2 = X-5.1 Y6.6Z-1.25,
and d3 = X-4.54 Y6.6 Z-1.25

c) #n#INS POINT : Model loc d1d2 [RETURN]
where d1 = X-8.5 Y3 Z-1.25, and
d2 = X-8.5 Y4.5 Z-1.25
#n#INS LABEL /[B5] FLAG NO. 3 [X]/ HEIGHT 0.2 : Model ent d1 Model loc d2d3 ; Model ent d4
Model loc d5d6 [RETURN]
where d2=d5= X-6 Y3.6 Z-1.25, and
d3=d6= X-4.54 Y3.6 Z-1.25. d1 and d4 are digitized.

Comments : Flag note with leaders is supported through label with Feature Control Symbol as flag.

* GENERAL LABEL (210) : Label -

Given : Reference Attachment 1.

CV Implementation :

#n#INS POINT : Model loc d1d2d3d4 [RETURN]

a) #n#INS LABEL /LABEL 1/ HEIGHT 0.2 : Model ent d1 Model loc d2d3 [RETURN]

b) #n#INS LABEL /LABEL 2/ HEIGHT 0.2 : Model ent d1 Model loc d2d3 [RETURN]

c) #n#INS LABEL /LABEL 3/ HEIGHT 0.2 : Model ent d1 Model loc d2 ; Model ent d3 Model loc d4d5 [RETURN]

Comments : Well supported.

* GENERAL NOTE (212) : Text -

Given : Reference Attachment 1.

CV Implementation :

a) #n#INS TEXT /TEXT 1/ HEIGHT 1.0 ANGLE 30 : Model loc X15.0 Y4.0 Z1 [RETURN]

b) #n#INS TEXT /TEXT 2/ HEIGHT 0.5 ANGLE 120 : Model loc X14.0 Y5.0 Z1 [RETURN]

c) #n#INS TEXT /TEXT 3/ HEIGHT 0.2 ANGLE 210 : Model loc X13.0 Y4 Z2 [RETURN]

d) #n#INS TEXT /TEXT 4/ HEIGHT 0.1 ANGLE 300 : Model loc X14.0 Y3 Z3 [RETURN]

Comments : Well supported.

* LINEAR DIMENSION (216) : Linear Dimension -

Given : Reference Attachment 1.

CV Implementation :

a) #n#INS LINE : Model loc d1d2 [RETURN]
#n#INS LDIMENSION VERTICAL TEXT MAIN /5.00/ HEIGHT 0.2 Model end d1d2 Model loc X28.01 Y5.6 Z2.5 [RETURN]

b) #n#INS POINT : Model loc X21 Y6.44 Z2.5, X25.97 Y6.44 Z2.5 [RETURN]
#n#INS LDIMENSION TEXT MAIN /5.00/ HEIGHT 0.2 LOCATION AUTOCENTER SUPPRESS EXTENSION BOTH : Model end d1d2 Model loc X23.485 Y6.99 Z2.5

[RETURN]

c) #n#INS LINE : Model loc d1d2 [RETURN]
#n#INS LDIM VERTICAL : Model end d1d2 Model loc d3 [RETURN]
#n#INS LDIMENSION TEXT MAIN /3.60/ HEIGHT 0.2 LOCATION HEAD ALIGN : Model end d1d2 Model ent d3 Model loc d4 [RETURN]

Comments : Well supported.

* ORDINATE DIMENSION (218) : Ordinate dimension -

Given : Reference Attachment 1.

CV Implementation :

a) #n#INS LINE VERTICAL : Model loc X-28.5 Y-2 Z-0.5, IY-4 [RETURN]
#n#INS ODIMENSION VERTICAL ARROWHEAD TEXT MAIN /4.00/ HEIGHT 0.2 : Digitize datum reference point d1 Model loc d2 Model end d3 Model loc d4 [RETURN]

b) #n#INS LINE VERTICAL : Model loc X-28.5 Y-4 Z-0.5, IY-4 [RETURN]
#n#INS ODIMENSION VERTICAL TEXT MAIN /4.00/ HEIGHT 0.2 : Digitize datum reference point d1 Model loc d2 Model end d3 Model loc d4 [RETURN]

c) #n#INS LINE HORIZONTAL : Model loc X-22 Y-3 Z-0.5, IX-2.52 [RETURN]
#n#INS ODIMENSION HORIZONTAL ARROWHEAD TEXT MAIN /2.52/ HEIGHT 0.2 : Digitize datum reference point d1 Model loc d2 Model end d3 Model loc d4 [RETURN]

Comments : Well supported.

* POINT DIMENSION (220) : Ordinate dimension -

Given : Reference Attachment 1.

CV Implementation :

a) #n#INS POINT : Model loc X-14.6 Y-7.4 Z-1 [RETURN]
#n#INS ODIMENSION TEXT MAIN / POINT 1 / HEIGHT 0.2 CIRCLE : Digitize datum reference point d1 Model loc d2 Model end d3 Model loc d4d5d6 [RETURN]

b) #n#INS LINE : Model loc d1d2d3d4 [RETURN]
#n#INS TEXT /POINT 2/ HEIGHT 0.2 : Model loc d5 [RETURN]
#n#CONSTRUCT GROUP : d1d2d3d4 [RETURN]

Comments : Supported through ordinate dimension.

* RADIUS DIMENSION (222) : Radial dimension -

Given : Reference Attachment 1.

CV Implementation :

a) #n#INSCIRCLERADIUS1.0: Modellocd1 [RETURN]
#n#INS RDIMENSION TEXT MAIN /1.000/ HEIGHT 0.2 : Model ent d1 Model loc d2d3 [RETURN]

b) #n#INS CIRCLERADIUS1.0:Modellocd1 [RETURN]
#n#INS RDIMENSION ARROW OUT TEXT MAIN /1.000/ HEIGHT 0.2 : Model ent d1 Model loc d2d3 [RETURN]

Comments : Well supported.

* SUBFIGURE DEFINITION (308) : Subfigure part file -

Given : Reference Attachment 1.

CV Implementation :

#ACT PART <PART NAME> [RETURN]
#n#INS TEXT /SUBFIGURE/ HEIGHT 0.8 : Model loc X0 Y0 Z0 [RETURN]
#n#INS TEXT /(408)/ HEIGHT 0.8 : Model loc X1.5 Y-1.5 Z0 [RETURN]
#n#EXIT PART FILE SFIG [RETURN]

Comments : Well supported.

* DRAWING ENTITY (404) : Drawing -

Given : Reference Attachment 1.

CV Implementation :

#ACT DRAWING D1 HGT 125 WDT 150 [RETURN]
#ROTATE ENTITY MODEL AZ-30AY-30AX-30 : Model

```
ent : Window d1d2 ; Model loc X0Y0Z0 [RETURN]
#DEF CPL V1 AX30AY30AZ30 : Model loc X5.69 Y14.34
Z-2.24 [RETURN]
#DEF VIEW V1 CPL V1 : Draw loc X35Y35 [RETURN]

#DEF CPL V2 AX-76.1AY25.66AZ-33.69 : Model loc
X3.19 Y11.24 Z-1.61 [RETURN]
#DEF VIEW V2 CPL V2 : Draw loc X35 Y105 [RETURN]
#DEF CPL V3 AX-19.11AY-48.59AZ40.89 : Model loc
X3.19 Y11.24 Z-1.61 [RETURN]
#DEF VIEW V3 CPL V3 : Draw loc X105 Y35 [RETURN]
#DEF CPL V4 : Model loc X3.19 Y11.24 Z-1.61
[RETURN]
#DEF VIEW V4 CPL V4 : Draw loc X105 Y105 [RETURN]
```

Comments : Well supported.

* SUBFIGURE INSTANCE (408) : Subfigure instance -

Given : Reference Attachment 1.

CV Implementation :

```
#n#INS SFIGURE <NAME> : Model loc d1... [RETURN]
#n#INS SFIGURE SUBFIG : Model loc X1.69 Y-3.15
Z-3.19 [RETURN]
```

Comments : Well supported.

ATTACHMENT 3

```
_V28ENT.&BCD.IGES
 8-20-87 13:33:56 FUTIL 10.27

   1!RECREATED 28-ENTITY TESTFILE ON CV-CADDS-4X                                S
        1
   2!..2HD1.3HN05.46HCOMPUTERVISION CADDS4X REV 4.1 GRAPHIC SYSTEM .16HIGES VG
        1
   3!ERSION 3.0.16.8.24.8.5e.2HD1.1.0.1.4HINCH.32767.32.767.13H87 320.133302.G
        2
   4!0.000001..19HSAURIN.ANDY & KEVIN.22HATC-BARRIOS TECHNOLOGY;                G
        3
   5!     124        1        1        0        0        0        0        0  1D
             1
   6!     124        0        0        1        0                             D
             2
   7!     124        2        1        0        0        0        0        0  1D
             3
   8!     124        0        0        1        0                             D
             4
   9!     124        3        1        0        0        0        0        0  1D
             5
  10!     124        0        0        1        0                             D
             6
  11!     124        4        1        0        0        0        0        0  1D
             7
  12!     124        0        0        1        0                             D
             8
  13!     124        5        1        0        0        0        0        0  1D
             9
  14!     124        0        0        1        0                             D
            10
  15!     124        6        1        0        0        0        0        0  1D
            11
  16!     124        0        0        1        0                             D
            12
  17!     212        7        1        1        0        0        0        0  10101D
            13
  18!     212        0        0        1        0                             D
            14
  19!     212        8        1        1        0        0        0        0  10101D
            15
  20!     212        0        0        1        0                             D
            16
  21!     308        9        1        0        0        0        0        0  20201D
            17
  22!     308        0        0        1        0                             D
            18
  23!     124       10        1        0        0        0        0        0  1D
            19
  24!     124        0        0        1        0                             D
            20
  25!     124       11        1        0        0        0        0        0  1D
            21
  26!     124        0        0        1        0                             D
            22
  27!     124       12        1        0        0        0        0        0  1D
            23
  28!     124        0        0        1        0                             D
            24
```

29!	124	13	1	0	0	0	0	0	1D
	25								
30!	124	0	0	1	0				D
	26								
31!	124	14	1	0	0	0	0	0	1D
	27								
32!	124	0	0	1	0				D
	28								
33!	124	15	1	0	0	0	0	0	1D
	29								
34!	124	0	0	1	0				D
	30								
35!	124	16	1	0	0	0	0	0	1D
	31								
36!	124	0	0	2	0				D
	32								
37!	406	18	1	0	0	0	0	0	10201D
	33								
38!	406	0	0	1	15				D
	34								
39!	124	19	1	0	0	0	0	0	10101D
	35								
40!	124	0	0	1	0				D
	36								
41!	108	20	1	0	0	0	0	0	10001D
	37								
42!	108	0	0	1	0				D
	38								
43!	108	21	1	0	0	0	0	0	10001D
	39								
44!	108	0	0	1	0				D
	40								
45!	108	22	1	0	0	0	0	0	10001D
	41								
46!	108	0	0	1	0				D
	42								
47!	108	23	1	0	0	0	0	0	10001D
	43								
48!	108	0	0	1	0				D
	44								
49!	410	24	1	0	0	0	35	0	10201D
	45								
50!	410	0	0	1	0				D
	46								
51!	406	25	1	0	0	0	0	0	10201D
	47								
52!	406	0	0	1	15				D
	48								
53!	124	26	1	0	0	0	0	0	10101D
	49								
54!	124	0	0	2	0				D
	50								
55!	108	28	1	0	0	0	0	0	10001D
	51								
56!	108	0	0	1	0				D
	52								
57!	108	29	1	0	0	0	0	0	10001D
	53								
58!	108	0	0	1	0				D
	54								

59!	108	30	1	0	0	0	0	0	10001D
55									
60!	108	0	0	1	0				D
56									
61!	108	31	1	0	0	0	0	0	10001D
57									
62!	108	0	0	1	0				D
58									
63!	410	32	1	0	0	0	40	0	10201D
59									
64!	410	0	0	1	0				D
60									
65!	406	33	1	0	0	0	0	0	10201D
61									
66!	406	0	0	1	15				D
62									
67!	124	34	1	0	0	0	0	0	10101D
63									
68!	124	0	0	2	0				D
64									
69!	108	36	1	0	0	0	0	0	10001D
65									
70!	108	0	0	1	0				D
66									
71!	108	37	1	0	0	0	0	0	10001D
67									
72!	108	0	0	1	0				D
68									
73!	108	38	1	0	0	0	0	0	10001D
69									
74!	108	0	0	1	0				D
70									
75!	108	39	1	0	0	0	0	0	10001D
71									
76!	108	0	0	1	0				D
72									
77!	410	40	1	0	0	0	63	0	10201D
73									
78!	410	0	0	1	0				D
74									
79!	406	41	1	0	0	0	0	0	10201D
75									
80!	406	0	0	1	15				D
76									
81!	124	42	1	0	0	0	0	0	10101D
77									
82!	124	0	0	2	0				D
78									
83!	108	44	1	0	0	0	0	0	10001D
79									
84!	108	0	0	1	0				D
80									
85!	108	45	1	0	0	0	0	0	10001D
81									
86!	108	0	0	1	0				D
82									
87!	108	46	1	0	0	0	0	0	10001D
83									
88!	108	0	0	1	0				D
84									

89!	108 85	47	1	0	0	0	0	0	10001D
90!	10ɔ 86	0	0	1	0				D
91!	410 87	48	1	0	0	0	77	0	10201D
92!	410 88	0	0	1	0				D
93!	100 89	49	1	1	0	0	31	0	1D
94!	100 90	0	0	1	0			ARC	1D
95!	110 91	50	1	1	0	0	0	0	20001D
96!	110 92	0	0	1	0			LINE	1D
97!	110 93	51	1	1	0	0	0	0	20001D
98!	110 94	0	0	1	0			LINE	2D
99!	110 95	52	1	1	0	0	0	0	20001D
100!	110 96	0	0	1	0			LINE	3D
101!	100 97	53	1	1	0	0	31	0	20001D
102!	100 98	0	0	1	0			ARC	2D
103!	100 99	54	1	1	0	0	31	0	20001D
104!	100 100	0	0	1	0			ARC	3D
105!	110 101	55	1	1	0	0	0	0	20001D
106!	110 102	0	0	1	0			LINE	4D
107!	110 103	56	1	1	0	0	0	0	20001D
108!	110 104	0	0	1	0			LINE	5D
109!	124 105	57	1	0	0	0	31	0	1D
110!	124 106	0	0	1	0				D
111!	104 107	58	1	1	0	0	105	0	1D
112!	104 108	0	0	2	0			CONIC	1D
113!	124 109	60	1	0	0	0	31	0	1D
114!	124 110	0	0	2	0				D
115!	104 111	62	1	1	0	0	109	0	1D
116!	104 112	0	0	1	0			CONIC	2D
117!	116 113	63	1	1	0	0	0	0	1D
118!	116 114	0	0	1	0			POINT	4D

119!	116 115	64	1	1	0	0	0	0		1D
120!	116 116	0	0	1	0				POINT	3D
121!	116 117	65	1	1	0	0	0	0		1D
122!	116 118	0	0	1	0				POINT	2D
123!	116 119	66	1	1	0	0	0	0		1D
124!	116 120	0	0	1	0				POINT	1D
125!	105 121	67	1	1	0	0	0	0		1D
126!	105 122	0	0	2	0				PLANE	D
127!	110 123	69	1	1	0	0	0	0		1D
128!	110 124	0	0	1	0				LINE	6D
129!	110 125	70	1	1	0	0	0	0		1D
130!	110 126	0	0	1	0				LINE	7D
131!	110 127	71	1	1	0	0	0	0		1D
132!	110 128	0	0	1	0				LINE	8D
133!	110 129	72	1	1	0	0	0	0		1D
134!	110 130	0	0	1	0				LINE	9D
135!	110 131	73	1	1	0	0	0	0		1D
136!	110 132	0	0	1	0				LINE	10D
137!	110 133	74	1	1	0	0	0	0		1D
138!	110 134	0	0	1	0				LINE	11D
139!	116 135	75	1	1	0	0	0	0		1D
140!	110 136	0	0	1	0				POINT	5D
141!	116 137	76	1	1	0	0	0	0		1D
142!	116 138	0	0	1	0				POINT	6D
143!	116 139	77	1	1	0	0	0	0		1D
144!	116 140	0	0	1	0				POINT	7D
145!	110 141	78	1	1	0	0	0	0		20001D
146!	110 142	0	0	1	0					D
147!	110 143	79	1	1	0	0	0	0		20001D
148!	110 144	0	0	1	0					D

149!	110	80	1	1	0	0	0	0	20001D	
	145									
150!	110	0	0	1	0				D	
	146									
151!	106	81	1	1	0	0	0	0	1D	
	147									
152!	106	0	0	4	12			STRING	D	
	148									
153!	112	85	1	1	0	0	0	0	1D	
	149									
154!	112	0	0	34	0			SPLINE	D	
	150									
155!	212	119	1	0	0	0	0	0	10101D	
	151									
156!	212	0	0	1	0				D	
	152									
157!	214	120	1	1	0	0	0	0	10101D	
	153									
158!	214	0	0	1	3				D	
	154									
159!	214	121	1	1	0	0	0	0	10101D	
	155									
160!	214	0	0	1	3				D	
	156									
161!	106	122	1	1	0	0	0	0	10001D	
	157									
162!	106	0	0	1	40				D	
	158									
163!	106	123	1	1	0	0	0	0	10001D	
	159									
164!	106	0	0	1	40				D	
	160									
165!	202	124	1	1	0	0	31	0	101D	
	161									
166!	202	0	0	1	0			ADIM	2D	
	162									
167!	212	125	1	0	0	0	0	0	10101D	
	163									
168!	212	0	0	1	0				D	
	164									
169!	214	126	1	1	0	0	0	0	10101D	
	165									
170!	214	0	0	1	3				D	
	166									
171!	214	127	1	1	0	0	0	0	10101D	
	167									
172!	214	0	0	1	3				D	
	168									
173!	202	128	1	1	0	0	31	0	101D	
	169									
174!	202	0	0	1	0			ADIM	1D	
	170									
175!	212	129	1	0	0	0	0	0	10101D	
	171									
176!	212	0	0	1	0				D	
	172									
177!	214	130	1	1	0	0	0	0	10101D	
	173									
178!	214	0	0	1	3				D	
	174									

179!	214	131	1	1	0	0	0	0	10101D
175									
180!	214	0	0	2	3				D
176									
181!	206	133	1	1	0	0	31	0	101D
177									
182!	206	0	0	1	0			DDI4	2D
178									
183!	212	134	1	0	0	0	0	0	10101D
179									
184!	212	0	0	1	0				D
180									
185!	214	135	1	1	0	0	0	0	10101D
181									
186!	214	0	0	1	3				D
182									
187!	222	136	1	1	0	0	31	0	101D
183									
188!	222	0	0	1	0			RDI4	2D
184									
189!	212	137	1	0	0	0	0	0	10101D
185									
190!	212	0	0	1	0				D
186									
191!	214	138	1	1	0	0	0	0	10101D
187									
192!	214	0	0	1	3				D
188									
193!	214	139	1	1	0	0	0	0	10101D
189									
194!	214	0	0	1	3				D
190									
195!	106	140	1	1	0	0	0	0	10001D
191									
196!	106	0	0	1	40				D
192									
197!	106	141	1	1	0	0	0	0	10001D
193									
198!	106	0	0	1	40				D
194									
199!	216	142	1	1	0	0	31	0	101D
195									
200!	216	0	0	1	0			LDI4	3D
196									
201!	212	143	1	0	0	0	0	0	10101D
197									
202!	212	0	0	1	0				D
198									
203!	214	144	1	1	0	0	0	0	10101D
199									
204!	214	0	0	1	3				D
200									
205!	214	145	1	1	0	0	0	0	10101D
201									
206!	214	0	0	1	3				D
202									
207!	106	146	1	1	0	0	0	0	10100D1D
203									
208!	106	0	0	1	40				D
204									

209!	106 205	147	1	1	0	0	0	0	10100010
210!	106 206	0	0	1	40				0
211!	216 207	148	1	1	0	0	31	0	1010
212!	216 208	0	0	1	0			LDIM	20
213!	212 209	149	1	0	0	0	0	0	101010
214!	212 210	0	0	1	0				0
215!	214 211	150	1	1	0	0	0	0	101010
216!	214 212	0	0	1	3				0
217!	214 213	151	1	1	0	0	0	0	101010
218!	214 214	0	0	1	3				0
219!	206 215	152	1	1	0	0	31	0	1010
220!	206 216	0	0	1	0			DDIM	10
221!	212 217	153	1	0	0	0	0	0	10101
222!	212 218	0	0	1	0				0
223!	214 219	154	1	1	0	0	0	0	101010
224!	214 220	0	0	1	4				0
225!	218 221	155	1	1	0	0	31	0	1010
226!	218 222	0	0	1	0			ODIM	20
227!	212 223	156	1	0	0	0	0	0	10101
228!	212 224	0	0	1	0				0
229!	214 225	157	1	1	0	0	0	0	101010
230!	214 226	0	0	2	3				0
231!	222 227	159	1	1	0	0	31	0	101
232!	222 228	0	0	1	0			RDIM	10
233!	212 229	160	1	0	0	0	0	0	10101
234!	212 230	0	0	1	0				0
235!	214 231	161	1	1	0	0	0	0	10101
236!	214 232	0	0	1	3				0
237!	218 233	162	1	1	0	0	31	0	101
238!	218 234	0	0	1	0			ODIM	30

239!	212	163	1	0	0	0	0	0	10101D
	235								
240!	212	0	0	1	0				D
	236								
241!	214	164	1	1	0	0	0	0	10101D
	237								
242!	214	0	0	1	3				D
	238								
243!	214	165	1	1	0	0	0	0	10101D
	239								
244!	214	0	0	1	3				D
	240								
245!	106	166	1	1	0	0	0	0	10001D
	241								
246!	106	0	0	1	40				D
	242								
247!	106	167	1	1	0	0	0	0	10001D
	243								
248!	106	0	0	1	40				D
	244								
249!	216	168	1	1	0	0	31	0	101D
	245								
250!	216	0	0	1	0			LDIM	ID
	246								
251!	212	169	1	0	0	0	0	0	10101D
	247								
252!	212	0	0	2	0				D
	248								
253!	100	171	1	0	0	0	0	0	10001D
	249								
254!	100	0	0	1	0				D
	250								
255!	214	172	1	1	0	0	0	0	10101D
	251								
256!	214	0	0	2	4				D
	252								
257!	220	174	1	1	0	0	31	0	101D
	253								
258!	220	0	0	1	0			PDIM	ID
	254								
259!	212	175	1	0	0	0	0	0	10101D
	255								
260!	212	0	0	1	0				D
	256								
261!	214	176	1	1	0	0	0	0	10101D
	257								
262!	214	0	0	1	3				D
	258								
263!	214	177	1	1	0	0	0	0	10101D
	259								
264!	214	0	0	2	3				D
	260								
265!	206	179	1	1	0	0	31	0	101D
	261								
266!	206	0	0	1	0			DDIM	3D
	262								
267!	212	180	1	0	0	0	0	0	10101D
	263								
268!	212	0	0	1	0				D
	264								

269!	214 265	181	1	1	0	0	0	0	101D1D
270!	214 266	0	0	1	3				0
271!	218 267	182	1	1	0	0	31	0	101D
272!	218 268	0	0	1	0			0D1X	1D
273!	212 269	183	1	1	0	0	31	0	101D
274!	212 270	0	0	2	0			TX	1D
275!	212 271	185	1	1	0	0	31	0	101D
276!	212 272	0	0	2	0			TX	2D
277!	212 273	187	1	1	0	0	31	0	101D
278!	212 274	0	0	2	0			TX	3D
279!	212 275	189	1	1	0	0	31	0	101D
280!	212 276	0	0	1	0			TX	4D
281!	212 277	190	1	1	0	0	31	0	101D
282!	212 278	0	0	1	0			TX	5D
283!	212 279	191	1	1	0	0	31	0	101D
284!	212 280	0	0	2	0			TX	6D
285!	212 281	193	1	1	0	0	31	0	101D
286!	212 282	0	0	1	0			TX	7D
287!	212 283	194	1	1	0	0	31	0	101D
288!	212 284	0	0	2	0			TX	8D
289!	212 285	196	1	1	0	0	31	0	101D
290!	212 286	0	0	2	0			TX	9D
291!	212 287	198	1	1	0	0	31	0	101D
292!	212 288	0	0	2	0			TX	10D
293!	212 289	200	1	1	0	0	31	0	101D
294!	212 290	0	0	2	0			TX	11D
295!	212 291	202	1	1	0	0	31	0	101D
296!	212 292	0	0	2	0			TX	12D
297!	212 293	204	1	1	0	0	31	0	101D
298!	212 294	0	0	2	0			TX	13D

299!	212	206	1	0	0	0	0	0	10101D
	295								
300!	212	0	0	1	0				D
	296								
301!	106	207	1	0	0	0	0	0	10101D
	297								
302!	106	0	0	2	11				D
	298								
303!	223	209	1	1	0	0	31	0	101D
	299								
304!	226	0	0	1	0			FLAG	1D
	300								
305!	212	210	1	1	0	0	31	0	101D
	301								
306!	212	0	0	2	0			TX	14D
	302								
307!	212	212	1	1	0	0	31	0	101D
	303								
308!	212	0	0	2	0			TX	15D
	304								
309!	212	214	1	1	0	0	31	0	101D
	305								
310!	212	0	0	1	0			TEXT	1D
	306								
311!	212	215	1	0	0	0	0	0	10101D
	307								
312!	212	0	0	1	0				D
	308								
313!	214	216	1	0	0	0	0	0	10101D
	309								
314!	214	0	0	1	3				D
	310								
315!	214	217	1	0	0	0	0	0	10101D
	311								
316!	214	0	0	1	3				D
	312								
317!	210	218	1	1	0	0	31	0	101D
	313								
318!	210	0	0	1	0			LABEL	3D
	314								
319!	212	219	1	1	0	0	31	0	101D
	315								
320!	212	0	0	2	0			TX	17D
	316								
321!	212	221	1	0	0	0	0	0	10101D
	317								
322!	212	0	0	1	0				D
	318								
323!	214	222	1	0	0	0	0	0	10101D
	319								
324!	214	0	0	1	3				D
	320								
325!	210	223	1	1	0	0	31	0	101D
	321								
326!	210	0	0	1	0			LABEL	1D
	322								
327!	212	224	1	0	0	0	0	0	10101D
	323								
328!	212	0	0	1	0				D
	324								

329!	214	225	1	0	0	0	0	0	10101D
	325								
330!	214	0	0	1	3				D
	326								
331!	210	226	1	1	0	0	31	0	101D
	327								
332!	210	0	0	1	0			LABEL	2D
	328								
333!	212	227	1	1	0	0	31	0	101D
	329								
334!	212	0	0	1	0			TEXT	2D
	330								
335!	212	228	1	1	0	0	31	0	101D
	331								
336!	212	0	0	1	0			TEXT	3D
	332								
337!	212	229	1	1	0	0	31	0	101D
	333								
338!	212	0	0	1	0			TEXT	4D
	334								
339!	212	230	1	1	0	0	31	0	101D
	335								
340!	212	0	0	2	0			TX	21D
	336								
341!	212	232	1	1	0	0	31	0	20101D
	337								
342!	212	0	0	2	0				D
	338								
343!	212	234	1	1	0	0	31	0	101D
	339								
344!	212	0	0	2	0			TX	23D
	340								
345!	212	236	1	0	0	0	0	0	10101D
	341								
346!	212	0	0	1	0				D
	342								
347!	214	237	1	0	0	0	0	0	10101D
	343								
348!	214	0	0	1	3				D
	344								
349!	106	238	1	0	0	0	0	0	10101D
	345								
350!	106	0	0	2	11				D
	346								
351!	228	240	1	1	0	0	31	0	101D
	347								
352!	228	0	0	1	0			FLAG	2D
	348								
353!	212	241	1	1	0	0	31	0	101D
	349								
354!	212	0	0	2	0			TX	24D
	350								
355!	212	243	1	0	0	0	0	0	10101D
	351								
356!	212	0	0	1	0				D
	352								
357!	214	244	1	0	0	0	0	0	10101D
	353								
358!	214	0	0	1	3				D
	354								

359!	214	245	1	0	0	0	0	0	10101D
	355								
360!	214	0	0	1	3				D
	356								
361!	106	246	1	0	0	0	0	0	10101D
	357								
362!	106	0	0	2	11				D
	358								
363!	228	248	1	1	0	0	31	0	101D
	359								
364!	228	0	0	1	0			FLAG	3D
	360								
365!	212	249	1	1	0	0	31	0	101D
	361								
366!	212	0	0	2	0			TX	25D
	362								
367!	212	251	1	1	0	0	31	0	101D
	363								
368!	212	0	0	2	0			TX	26D
	364								
369!	124	253	1	0	0	0	0	0	1D
	365								
370!	124	0	0	2	0				D
	366								
371!	408	255	1	1	0	0	365	0	1D
	367								
372!	408	0	0	1	0			SUBFIG	D
	368								
373!	100	256	1	0	0	0	31	0	20001D
	369								
374!	100	0	0	1	0				D
	370								
375!	100	257	1	0	0	0	31	0	20001D
	371								
376!	100	0	0	1	0				D
	372								
377!	406	258	1	0	0	0	0	0	10201D
	373								
378!	406	0	0	1	5556				D
	374								
379!	118	259	1	1	0	0	0	0	1D
	375								
380!	118	0	0	1	0			RSURF	2D
	376								
381!	110	260	1	0	0	0	0	0	20001D
	377								
382!	110	0	0	1	0				D
	378								
383!	110	261	1	0	0	0	0	0	20001D
	379								
384!	110	0	0	1	0				D
	380								
385!	406	262	1	0	0	0	0	0	10201D
	381								
386!	406	0	0	1	5558				D
	382								
387!	110	263	1	1	0	0	0	0	1D
	383								
388!	118	0	0	1	0			RSURF	1D
	384								

```
389!    110   264   1   0   0   0   0   0   10001D
        385
390!    110   0     0   1   0                   D
        386
391!    100   265   1   0   0   0   31  0   20001D
        387
392!    100   0     0   1   0                   D
        388
393!    406   266   1   0   0   0   0   0   10201D
        389
394!    406   0     0   1   5558                D
        390
395!    120   267   1   1   0   0   0   0   1D
        391
396!    120   0     0   1   0           SREV    2D
        392
397!    110   268   1   0   0   0   0   0   10001D
        393
398!    110   0     0   1   0                   D
        394
399!    110   269   1   0   0   0   0   0   20001D
        395
400!    110   0     0   1   0                   D
        396
401!    406   270   1   0   0   0   0   0   10201D
        397
402!    406   0     0   1   5558                D
        398
403!    120   271   1   1   0   0   0   0   1D
        399
404!    120   0     0   1   0           SREV    1D
        400
405!    110   272   1   0   0   0   0   0   20001D
        401
406!    110   0     0   1   0                   D
        402
407!    406   273   1   0   0   0   0   0   10201D
        403
408!    406   0     0   1   5558                D
        404
409!    122   274   1   1   0   0   0   0   1D
        405
410!    122   0     0   1   0           TBCYL   2D
        406
411!    100   275   1   0   0   0   31  0   20001D
        407
412!    100   0     0   1   0                   D
        408
413!    406   276   1   0   0   0   0   0   10201D
        409
414!    406   0     0   1   5558                D
        410
415!    122   277   1   1   0   0   0   0   1D
        411
416!    122   0     0   1   0           TBCYL   1D
        412
417!    406   278   1   0   0   0   0   0   10201D
        413
418!    406   0     0   1   5558                D
        414
```

```
419!     114     279     1       1       0       0       0       0       1D
415
420!     114     0       0       75      0                       SPLS'JR D
416
421!     110     354     1       0       0       0       0       0       10001D
417
422!     110     0       0       1       0                               D
418
423!     110     355     1       0       0       0       0       0       20001D
419
424!     110     0       0       1       0                               D
420
425!     406     356     1       0       0       0       0       0       10201D
421
426!     406     0       0       1       555&                            D
422
427!     120     357     1       1       0       0       0       0       1D
423
428!     120     0       0       1       0                       SREV    3D
424
429!     402     358     1       0       0       0       0       0       201D
425
430!     402     0       0       1       1                               D
426
431!     402     359     1       0       0       0       0       0       201D
427
432!     402     0       0       1       1                               D
428
433!     406     360     1       0       0       0       0       0       10201D
429
434!     406     0       0       1       15                              D
430
435!     406     361     1       0       0       0       0       0       10201D
431
436!     406     0       0       1       17                              D
432
437!     406     362     1       0       0       0       0       0       10201D
433
438!     406     0       0       1       16                              D
434
439!     404     363     1       0       0       0       0       0       201D
435
440!     404     0       0       2       0                               D
436
441!124,1,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,1,0,0,0;                 1P
1
442!124,1,0,0,0,0,0,0,0,0,0,0,0,0,-1,0,0,0,0,0,1,0,0,0,0,0;              3P
2
443!124,0,0,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0;                 5P
3
444!124,1,0,0,0,0,0,0,0,0,0,0,-1,0,0,0,0,0,0,0,0,0,-1,0,0,0;            7P
4
445!124,0,0,0,0,-1,0,0,0,-1,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0;            9P
5
446!124,-1,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0;               11P
6
447!212,1,9,3,16,0,0,1,1,5708,0,0,0,0,0,0,0,0,0,0,0,9HSUBFIGURE;        13P
7
448!212,1,5,3,68,0,0,1,1,5708,0,0,0,0,1,5,-1,5,0,0,5H(408);             15P
8
```

```
449!303.0.6HSURFIC.2.13.15;                                                    17P
          9
450!124.1.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.0.1.0.0.0;                       19P
          10
451!124.1.0.0.0.0.0.0.0.0.0.0.-1.0.0.0.0.0.1.0.0.0.0.0;                        21P
          11
452!124.0.0.0.0.1.0.0.0.1.0.0.0.0.0.0.0.0.0.1.0.0.0.0;                         23P
          12
453!124.1.0.0.0.0.0.0.0.0.0.-1.0.0.0.0.0.0.0.0.0.-1.0.0.0;                     25P
          13
454!124.0.0.0.0.-1.0.0.0.-1.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0;                     27P
          14
455!124.-1.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0.1.0.0.0.0.0;                      29P
          15
456!124.0.75.0.433013.-0.5.0.0.-0.216506.0.375.0.433013.0.0.0.625,             31P
          16
457!-0.216506.0.75.0.0;                                                        31P
          17
458!406.1.2HV4;                                                                33P
          18
459!124.1.0.0.0.0.0.6.5705.0.0.1.0.0.0.-17.6376.0.0.0.0.1.0.1.61;              35P
          19
460!108.1.0.0.0.0.0.-111.571;                                                  37P
          20
461!108.0.0.1.0.0.0.37.6376;                                                   39P
          21
462!108.1.0.0.0.0.0.38.4295;                                                   41P
          22
463!108.0.0.1.0.0.0.-87.3624;                                                  43P
          23
464!410.19.1.0.37.39.41.43.0.0.0.1.33;                                         45P
          24
465!406.1.2HV3;                                                                47P
          25
466!124.0.500029.-0.432918.-0.750035.27.1401.0.432986.0.875038,                49P
          26
467!-0.216407.-17.9906.0.749996.-0.216545.0.624992.2.17228;                    49P
          27
468!108.0.500029.-0.432918.-0.750035.-132.14;                                  51P
          28
469!108.0.432986.0.875038.-0.216407.107.991;                                   53P
          29
470!108.0.500029.-0.432918.-0.750035.17.8599;                                  55P
          30
471!108.0.432986.0.875038.-0.216407.-17.0094;                                  57P
          31
472!410.19.1.0.51.53.55.57.0.0.0.1.47;                                         59P
          32
473!406.1.2HV2;                                                                61P
          33
474!124.0.749994.-0.216498.0.625011.1.33975E-03.-0.499995.0.433049,            63P
          34
475!0.749983.2.22796.-0.43303.-0.874984.0.216537.-8.34481;                     63P
          35
476!108.0.749994.-0.216498.0.625011.-35.0013;                                  65P
          36
477!108.-0.499995.0.433049.0.749983.17.772;                                    67P
          37
478!103.0.749994.-0.216498.0.625011.114.999;                                   69P
          38
```

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479!108,-0.499995,0.433049,0.749933,-107.226;
      39                                                                    71P
480!410,17,1.0,55,67,69,71,0,0,0,1,61;
      40                                                                    73P
481!406,1,24V1;
      41                                                                    75P
482!124,0.75,-0.216506,0.625,0.139143,0.433013,0.875,-0.216506,
      42                                                                    77P
483!-13.0175,-0.5,0.433013,0.75,6.1644;
      43                                                                    77P
484!108,0.75,-0.216506,0.625,-35.1391;
      44                                                                    79P
485!108,0.433013,0.875,-0.216506,108.017;
      45                                                                    81P
486!108,0.75,-0.216506,0.625,114.861;
      46                                                                    83P
487!108,0.433013,0.875,-0.216506,-16.9825;
      47                                                                    85P
488!410,16,1.0,79,81,83,85,0,0,0,1,75;
      48                                                                    87P
489!100,1.0,-25.0,25.0,-22.0,25.0,-22.0,24.9992;
      49                                                                    89P
490!110,-2.52516,27.5176,-16.2374,-2.15016,27.4094,-15.9249,1,427;
      50                                                                    91P
491!110,-2.15016,27.4094,-15.9249,-1.99167,26.8636,-15.5042,1,427;
      51                                                                    93P
492!110,-1.99167,26.8636,-15.5042,-2.42468,25.9886,-15.2877,1,427;
      52                                                                    95P
493!100,1.0,-16.5,25.0,-17.0,25.0,-16.0,25.0,1,427;
      53                                                                    97P
494!100,1.0,-15.5,25.5,-16.002,24.998,-14.998,26.002,1,427;
      54                                                                    99P
495!110,-0.49167,26.4306,-14.2542,0.474837,26.6516,-13.7374,1,427;
      55                                                                    101P
496!110,0.474837,26.6516,-13.7374,0.73381,24.5768,-12.3669,1,427;
      56                                                                    103P
497!124,1.0,0.0,0.0,0.0,-5.0,0.0,0.0,1.0,0.0,0.0,27.32,0.0,0.0,0.0,1.0,1.5;
      57                                                                    105P
498!104,2.26014,0.0,0.0,12.6523,0.0,0.0,0.0,0.0,-28.5959,0.0,0.0,3.557,0.0,
      58                                                                    107P
499!-4.50165E-03,-1.50337;
      59                                                                    107P
500!124,1.94707E-07,-1.0,0.0,0.0,-5.68,1.0,1.94707E-07,0.0,0.0,22.11,0.0,0.0,
      60                                                                    109P
501!0.0,1.0,1.5;
      61                                                                    109P
502!104,0.0,0.0,0.0,0.0,1.0,-2.0,0.0,0.0,0.0,0.0,0.0,0.0,2.27001,-2.13073,2.64,2.29783;
      62                                                                    111P
503!116,2.54244,15.6915,-6.03122;
      63                                                                    113P
504!116,1.68744,13.8195,-6.45372;
      64                                                                    115P
505!116,0.0255747,13.8504,-7.71279;
      65                                                                    117P
506!116,-1.41055,12.5361,-8.04473;
      66                                                                    119P
507!108,-0.660267,-0.18836,0.726898,-13.3756,0,20.7404,19.2282,
      67                                                                    121P
508!7.73225,5.7857;
      68                                                                    121P
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509!110.26.9413,19.5114,3.02933,28.8163,18.9701,9.59183;                    123P
   69
510!110.26.5083,18.6364,3.24584,28.3833,15.0951,9.80834;                    125P
   70
511!110.30.6913,18.4288,11.1543,29.8253,10.6788,11.5873;                    127P
   71
512!110.31.4413,18.2123,11.7793,30.5753,16.4623,12.2123;                    129P
   72
513!110.28.2673,16.1286,10.8663,27.4013,14.3786,11.2994;                    131P
   73
514!110.27.0843,15.4701,10.4579,28.5843,15.0371,11.7079;                    133P
   74
515!116.4.33203,15.4338,-5.35602;                                           135P
   75
516!116.5.85351,16.6434,-4.90676;                                           137P
   76
517!116.6.73121,17.3489,-4.59561;                                           139P
   77
518!110.-16.5298,-1.41694,-11.5351,-16.27,-0.89194,-11.665,1.425;           141P
   78
519!110.-16.5824,-3.60175,-10.3088,-16.5298,-1.41694,-11.5351,1.425;        143P
   79
520!110.-15.3074,-3.96981,-9.2463,-16.5824,-3.60175,-10.3088,1.425;         145P
   80
521!106.2,9.10.6575,20.3234,-4.62875,12.8833,22.4252,-3.69167,              147P
   81
522!13.923,23.1694,-2.76152,14.9829,23.6078,-1.64142,15.7333,               147P
   82
523!22.0355,0.433355,15.5637,21.0288,1.5614,13.8508,20.3676,1.4746,         147P
   83
524!12.5539,21.5864,0.573047,12.157,22.5453,0.421492;                       147P
   84
525!112.3,1.3,15.0.0,1.0,2.0,3.0,4.0,5.0,6.0,7.0,8.0,9.0,10.0,11.0,         149P
   85
526!12.0,13.0,14.0,15.0,-13.4689,0.137913,-0.184143,0.0908248,              149P
   86
527!20.6224,0.965727,-1.29414,0.535957,-18.3256,0.225042,-0.315768,         149P
   87
528!0.158429,-13.4243,0.0421021,0.0883319,-0.0468724,20.8799,               149P
   88
529!0.135311,0.463725,-0.236765,-18.2579,0.0687938,0.15952,                 149P
   89
530!-0.0750979,-13.3407,0.0781488,-0.0522852,0.0339081,21.2422,             149P
   90
531!0.352473,-0.246566,0.118798,-18.1047,0.162539,-0.065774,                149P
   91
532!0.0533479,-13.2809,0.0753026,0.049439,-0.0126475,21.4669,               149P
   92
533!0.215736,0.109829,-0.0528708,-17.9545,0.191035,0.0942698,               149P
   93
534!-0.0213505,-13.1688,0.136239,0.011497,-0.0197913,21.7396,               149P
   94
535!0.276732,-0.0467835,-9.87657E-03,-17.6906,0.315523,0.0302181,           149P
   95
536!-0.039712,-13.0409,0.0998588,-0.0478768,0.0351594,21.9577,              149P
   96
537!0.149586,-0.076413,0.0356363,-17.3846,0.256824,-0.0839177,              149P
   97
538!0.0685244,-12.9537,0.109583,0.0576015,-0.024375,22.0645,                149P
   98
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539!0.0096685,0.0284958,-0.0301081,-17.1481,0.284561,0.116555,                149P
   99
540!-0.0426203,-12.3109,0.151661,-0.0155234,4.52964E-03,22.1626,              149P
  100
541!0.0563357,-0.0618286,8.39011E-03,-16.7895,0.390011,-0.0112057,            149P
  101
542!8.59261E-04,-12.6703,0.134203,-1.93453E-03,-1.90608E-03,22.1755,          149P
  102
543!-0.0521512,-0.0566583,8.14109E-03,-16.4099,0.370177,                      149P
  103
544!-8.62739E-03,3.27222E-03,-12.5399,0.124616,-7.65276E-03,                  149P
  104
545!2.41264E-03,22.1093,-0.0960445,-0.027235,-7.88148E-03,-16.045,            149P
  105
546!0.362738,1.18676E-03,-8.61756E-03,-12.4205,0.116549,                      149P
  106
547!-4.14818E-04,-4.56476E-03,21.9737,-0.174159,-0.0508795,                   149P
  107
548!8.81322E-03,-15.6897,0.339263,-0.0246639,4.61737E-03,-12.309,             149P
  108
549!0.102025,-0.0141091,-4.97977E-04,21.7624,-0.249478,-0.0244398,            149P
  109
550!3.11883E-03,-15.3705,0.303787,-0.0109118,-0.0116839,-12.2215,             149P
  110
551!0.0723124,-0.0156031,1.55433E-03,21.4916,-0.289001,-0.0150833,            149P
  111
552!-0.0256233,-15.0892,0.247112,-0.0458636,0.0146194,-12.1633,               149P
  112
553!0.0457592,-0.0109401,4.4632E-04,21.1419,-0.396038,-0.0919533,             149P
  113
554!0.123374,-14.8734,0.109243,-2.00558E-03,-0.029875,-12.128,                149P
  114
555!0.025228,-9.60112E-03,-7.17847E-03,20.7973,-0.209822,0.278169,            149P
  115
556!-0.45254,-14.706,0.105607,-0.0916305,0.0668022,-12.1196,                  149P
  116
557!-0.0156026,-0.062273,-0.0430708,20.4131,-1.0111,-2.1589,                  149P
  117
558!-2.71524,-14.6252,0.122752,0.217552,0.400813;                             149P
  118
559!212,1,9,1.86,0.2,1,1.5708,0.0,0.0,0.0,-26.2737,3.85,0.0,0.0,9H90.00 DEG;  151P
  119
560!214,1,0.2,0.025,0.0,-28.0,5.5,-25.5112,4.17501;                           153P
  120
561!214,1,0.2,0.025,0.0,-25.0,2.5,-25.2615,3.725;                            155P
  121
562!106,1,3,0.0,-28.0,4.8487,-26.0,4.9687,-28.0,5.6625;                       157P
  122
563!106,1,3,0.0,-25.6512,2.5,-25.5312,2.5,-24.8375,2.5;                       159P
  123
564!202,151,157,159,-28.0,2.5,3.0,155,153;                                    161P
  124
565!212,1,9,1.86,0.2,1,1.5708,0.0,0.0,0.0,-23.2737,6.85,0.0,0.0,9H90.00 DEG;  163P
  125
566!214,1,0.2,0.025,0.0,-25.0,8.5,-22.5112,7.175;                             165P
  126
567!214,1,0.2,0.025,0.0,-22.0,5.5,-22.2615,6.725;                            167P
  127
568!202,163,0.0,-25.0,5.5,3.0,167,165;                                        169P
  128
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569!212,1,5,1.0,0.2,1,1.5706,0.0,0.0,0.0,-15.125,7.53,0.0,0.5H4.000;                171P
      120
570!214,1,0.2,0.025,0.0,-15.8419,6.49016,-16.0,4.53;                               173P
      130
571!214,3,0.2,0.025,0.0,-16.1581,2.56984,-16.0,4.53,-15.75,7.63,                   175P
      131
572!-15.25,7.63;                                                                   175P
      132
573!206,171,173,175,-16.0,4.53;                                                    177P
      133
574!212,1,5,0.92,0.2,1,1.5706,0.0,0.0,0.0,-5.965,-6.6,0.0,0.5H1.000;               179P
      134
575!214,2,0.2,0.025,0.0,-5.0,-5.0,-4.5,-6.5,-5.0,-6.5;                             181P
      135
576!222,179,181,-1.5,-3.5;                                                         183P
      136
577!212,1,4,0.78,0.2,1,1.5708,0.0,0.0,0.0,22.51,5.5,0.0,0.4H3.60;                  185P
      137
578!214,1,0.2,0.025,0.0,22.01,5.2,22.01,1.6;                                       187P
      138
579!214,3,0.2,0.025,0.0,22.01,1.6,22.01,5.2,22.01,5.6,22.385,5.6;                  189P
      139
580!106,1,3,0.0,22.6612,5.2,22.5412,5.2,21.8475,5.2;                               191P
      140
581!106,1,3,0.0,22.6612,1.6,22.5412,1.6,21.8475,1.6;                               193P
      141
582!216,185,187,189,191,193;                                                       195P
      142
583!212,1,4,0.78,0.2,1,1.5708,0.0,0.0,0.0,22.75,6.9,0.0,0.4H5.00;                  197P
      143
584!214,1,0.2,0.025,2.5,21.0,7.0,22.625,7.0;                                       199P
      144
585!214,1,0.2,0.025,2.5,25.97,7.0,23.575,7.0;                                      201P
      145
586!106,1,3,2.5,21.0,6.9636,21.0,7.0836,21.0,7.1625;                               203P
      146
587!106,1,3,2.5,25.97,6.9636,25.97,7.0836,25.97,7.1625;                            205P
      147
588!216,197,199,201,203,205;                                                       207P
      148
589!212,1,5,1.0,0.2,1,1.5708,0.0,0.0,0.0,-16.3921,7.5,0.0,0.5H4.000;               209P
      149
590!214,1,0.2,0.025,0.0,-16.88,9.15,-17.7794,7.625;                                211P
      150
591!214,1,0.2,0.025,0.0,-19.12,5.85,-18.0849,7.375;                                213P
      151
592!206,209,211,213,-18.0,7.5;                                                     215P
      152
593!212,1,4,0.78,0.2,1,1.5708,0.0,0.0,0.0,-24.375,-4.1,0.0,0.4H4.00;               217P
      153
594!214,1,0.0,0.0,0.0,0.0,-28.5312,-4.0,-24.5,-4.0;                                219P
      154
595!218,217,219;                                                                   221P
      155
596!212,1,5,0.92,0.2,1,1.5708,0.0,0.0,0.0,-6.375,-2.6,0.0,0.5H1.000;               223P
      156
597!214,3,0.2,0.025,0.0,-8.40864,-1.8064,-9.0,-1.0,-7.9,-2.5,-7.0,                 225P
      157
598!-2.5;                                                                          225P
      158
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599!222,223,225,-9.0,-1.0;                                                    227P
        159
600!212,1,4,0.74,0.2,1,1.5708,1.5708,0,0,-21.9,-6.285,0.0,4H2.52;             229P
        160
601!214,1,0.2,0.025,0.0,-22.0,-2.9064,-22.0,-5.5;                             231P
        161
602!218,229,231;                                                              233P
        162
603!212,1,4,0.78,0.2,1,1.5708,0.0,0,0,27.66,5.5,0.0,4H5.00;                   235P
        163
604!214,1,0.2,0.025,2.5,28.01,8.01,28.01,5.825;                               237P
        164
605!214,1,0.2,0.025,2.5,28.01,3.01,28.01,5.375;                               239P
        165
606!106,1,3,2.5,28.63,8.01,28.51,8.01,27.8475,8.01;                           241P
        166
607!106,1,3,2.5,28.63,3.01,28.51,3.01,27.8475,3.01;                           243P
        167
608!216,235,237,239,241,243;                                                  245P
        168
609!212,1,13,2.5,0.2,1,1.5708,0.0,0,0,-13.95,-2.37493,0.0,13H   POIN       247P
        169
610!T 1   ;                                                                   247P
        170
611!100,0,0,-12.7,-2.27493,-11.4061,-2.27493,-11.4061,-2.27493;               249P
        171
612!214,3,0.0,0.0,0.0,0.0,-14.6,-7.3064,-14.6,-6.6683,-12.7,-4.0688,          251P
        172
613!-12.7,-3.5688;                                                            251P
        173
614!220,247,251,249;                                                          253P
        174
615!212,1,5,1.0,0.0,2,1,1.5708,0.0,0,0,-12.125,3.03,0.0,5H4.000;              255P
        175
616!214,1,0.2,0.025,0.0,-12.4338,4.55084,-12.0,6.5;                           257P
        176
617!214,3,0.2,0.025,0.0,-11.5662,8.44916,-12.0,6.5,-12.75,3.13,               259P
        177
618!-12.25,3.13;                                                              259P
        178
619!206,255,257,259,-12.0,6.5;                                                261P
        179
620!212,1,4,0.78,0.2,1,1.5708,0.0,0,0,-24.375,-2.1,0.0,4H4.00;                263P
        180
621!214,1,0.2,0.025,0.0,-28.5936,-2.0,-24.5,-2.0;                             265P
        181
622!218,263,265;                                                              267P
        182
623!212,1,18,5.55,0.3,1,1.5708,0.0,0,0,-28.0,20.48,0.0,18HCIRCULAR A          269P
        183
624!RC (100);                                                                 269P
        184
625!212,1,21,6.63,0.3,1,1.5708,0.0,0,0,-18.0,20.5,0.0,21HCOMPOSITE C          271P
        185
626!URVE (102);                                                               271P
        186
627!212,1,15,4.5,0.3,1,1.5708,0.0,0,0,-8.0,20.5,0.0,15HCONIC ARC (10           273P
        187
628!4);                                                                       273P
        188
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629!212,1,11,3.03,0.3,1,1,5708,0.0,0.0,0.0,-6.7,10.5,0.0,11HPOINT (116);
        189                                                                    275P
630!212,1,11,3.27,0.3,1,1,5708,0.0,0.0,0.0,13.5,20.5,0.0,11HPLANE (108);
        190                                                                    277P
631!212,1,19,5.76,0.3,1,1,5708,0.0,0.0,0.0,2.0,20.5,0.0,19HLINEAR STRING
        191                                                                    279P
632! (106);
        192                                                                    279P
633!212,1,10,2.7,0.3,1,1,5708,0.0,0.0,0.0,22.0,20.5,0.0,10HLINE (110);
        193                                                                    281P
634!212,1,12,3.33,0.3,1,1,5708,0.0,0.0,0.0,-26.0,13.5,0.0,12HSPLINE (112
        194                                                                    283P
635!);
        195                                                                    283P
636!212,1,24,7.62,0.3,1,1,5708,0.0,0.0,0.0,-19.0,0.5,0.0,24HDIAMETER DIM
        196                                                                    285P
637!ENSION (206);
        197                                                                    285P
638!212,1,19,5.91,0.3,1,1,5708,0.0,0.0,0.0,2.0,10.5,0.0,19HRULED SURFACE
        198                                                                    287P
639! (118);
        199                                                                    287P
640!212,1,19,5.55,0.3,1,1,5708,0.0,0.0,0.0,13.0,10.5,0.0,19HSURF. OF REV
        200                                                                    289P
641!. (120);
        201                                                                    289P
642!212,1,24,7.59,0.3,1,1,5708,0.0,0.0,0.0,22.0,10.5,0.0,24HTABULATED CY
        202                                                                    291P
643!LINDER (122);
        203                                                                    291P
644!212,1,23,7.26,0.3,1,1,5708,0.0,0.0,0.0,-29.0,0.5,0.0,23HANGULAR DIME
        204                                                                    293P
645!NSION (202);
        205                                                                    293P
646!212,1,12,2.38,0.2,1,1,5708,0.0,0.0,0.0,-4.5,8.5,0.0,12H FLAG NO. 1 ;
        206                                                                    295P
647!106,1,6,0.0,-4.54,8.4,-4.54,8.8,-2.08,8.8,-1.79437,8.6,-2.08,
        207                                                                    297P
648!8.4,-4.54,8.4;
        208                                                                    297P
649!228,295,1,297,0;
        209                                                                    299P
650!212,1,19,5.97,0.3,1,1,5708,0.0,0.0,0.0,2.0,0.5,0.0,19HGENERAL LABEL
        210                                                                    301P
651!(210);
        211                                                                    301P
652!212,1,21,6.48,0.3,1,1,5708,0.0,0.0,0.0,-16.0,-9.5,0.0,21HPOINT DIMEN
        212                                                                    303P
653!SION (220);
        213                                                                    303P
654!212,1,6,6.3,1,0,1,1,5708,0.523599,0.0,0.15,0.4,0.1,0.0,6HTEXT 1;
        214                                                                    305P
655!212,1,7,1.58,0.2,1,1,5708,0.0,0.0,0.0,1.375,3.4,0.0,7HLABEL 3;
        215                                                                    307P
656!214,1,0.2,0.025,0.0,7.5,3.5,3.0,3.5;
        216                                                                    309P
657!214,1,0.2,0.025,0.0,7.0,5.0,3.5625,3.5;
        217                                                                    311P
658!210,307,2,309,311;
        218                                                                    313P
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659!212,1,15,4,71,0,3,1,1,5708,0,0,0,0,-8,0,0,5,0,0,15HFLAG NOTE (20      315P
        219
660!8);
        220                                                                 315P
661!212,1,7,1,5,0,2,1,1,5708,0,0,0,0,0.675,8.4,0,0,7HLABEL 1;              317P
        221
662!214,2,0,2,0.025,0,0,3.6,7.5,2.5,8.5,2.2,8.5;
        222                                                                 319P
663!210,317,1,319;
        223                                                                 321P
664!212,1,7,1,56,0,2,1,1,5708,0,0,0,0,4.495,6.3,0,0,7HLABEL 2;             323P
        224
665!214,2,0,2,0.025,0,0,8.5,8.5,7.1,6.4,6.1,6.4;
        225                                                                 325P
666!210,323,1,325;
        226                                                                 327P
667!212,1,6,3,3,0,5,1,1,5708,2.0944,0,0,14,0,5,0,1,0,6HTEXT 2;             329P
        227
668!212,1,6,1,34,0,2,1,1,5708,3.66519,0,0,13,0,4,0,2,0,6HTEXT 3;           331P
        228
669!212,1,6,0,67,0,1,1,1,5708,5.23599,0,0,14,0,3,0,3,0,6HTEXT 4;           333P
        229
670!212,1,18,5,61,0,3,1,1,5708,0,0,0,0,12,0,0,5,0,0,18HGENERAL NOTE        335P
        230
671!(212);
        231                                                                 335P
672!212,1,7,1,48,0,2,1,1,5708,0,0,0,0,-17.9,-8.0,-1.0,7HPOINT 2.1,          337P
        232
673!425;
        233                                                                 337P
674!212,1,22,6.75,0,3,1,1,5708,0,0,0,0,-8.0,-9.5,0,0,22HRADIUS DIMEN       339P
        234
675!SION (222);
        235                                                                 339P
676!212,1,12,2.44,0,2,1,1,5708,0,0,0,0,-4.5,6.5,0,0,12H FLAG NO. 2 ;       341P
        236
677!214,2,0,2,0.025,0,0,-9.3,5.5,-5.1,6.6,-4.54,6.6;
        237                                                                 343P
678!106,1,6,0,0,-4.54,6.4,-4.54,6.8,-2.02,6.8,-1.73437,6.6,-2.02,          345P
        238
679!6.4,-4.54,6.4;
        239                                                                 345P
680!228,341,1,345,1,343;
        240                                                                 347P
681!212,1,22,6.75,0,3,1,1,5708,0,0,0,0,22,0,0,5,0,0,22HLINEAR DIMENS       349P
        241
682!ION (216);
        242                                                                 349P
683!212,1,12,2.46,0,2,1,1,5708,0,0,0,0,-4.5,3.5,0,0,12H FLAG NO. 3 ;       351P
        243
684!214,2,0,2,0.025,0,0,-8.5,3.0,-6.0,3.6,-4.54,3.6;
        244                                                                 353P
685!214,1,0,2,0.025,0,0,-8.5,4.5,-6.0,3.6;
        245                                                                 355P
686!106,1,6,0,0,-4.54,3.4,-4.54,3.6,-2.0,3.6,-1.71437,3.6,-2.0,3.4,        357P
        246
687!-4.54,3.4;
        247                                                                 357P
688!228,351,1,357,2,353,355;
        248                                                                 359P
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689!212,1,24,7,47,0,3,1,1,5708,0,0,0,0,-28,0,-9,5,0,0,24HORDINATE DI          351P
        249
690!MENSION (218);
        250                                                                    361P
691!212,1,20,6.09,0.3,1,1,5708,0,0,0,0,-18,0,10,5,0,0,20HSPLINE SURF          363P
        251
692!ACE (114);
        252                                                                    363P
693!124,0.75,0.433013,-0.5,1.49851,-0.216506,0.875,0.433013,                   365P
        253
694!-4.50346,0.625,-0.216506,0.75,-0.654255;                                    365P
        254
695!406,17,0,0,0,0,0,0,1,0;                                                     367P
        255
696!100,3,0,6,5,18,0,5,0,18,0,8,0,18,0;                                         369P
        256
697!100,1,0,6,5,14,0,5,0,14,0,5,0,14,0;                                         371P
        257
698!406,3,36,1,0;                                                               373P
        258
699!118,369,371,0,0,0,1,373;                                                    375P
        259
700!110,7.79423,16.016,-0.397114,10.0442,15.9665,1.47789;                       377P
        260
701!110,7.06218,12.25,-1.03109,9.31218,11.6005,0.843912;                        379P
        261
702!406,3,1,1,0;                                                               381P
        262
703!118,377,379,0,0,0,1,381;                                                    383P
        263
704!110,18.34,13.5331,7.08001,15.7419,8.28305,8.37905;                          385P
        264
705!100,2,0,17,0,17,13,17,37,17,13,17,0,18,0;                                   387P
        265
706!406,3,8,36,0;                                                              389P
        266
707!120,385,387,0,0,6.28319,0,1,389;                                            391P
        267
708!110,18.34,13.5331,7.08001,15.7419,8.28305,8.37905;                          393P
        268
709!110,15.7419,8.28305,8.37905,19.82,11.9858,8.96;                             395P
        269
710!406,3,1,36,0;                                                              397P
        270
711!120,393,395,0,0,6.28319,0,1,397;                                            399P
        271
712!110,25.7207,6.07508,13.6397,21.9707,7.15761,10.5147;                        401P
        272
713!406,3,1,1,0;                                                               403P
        273
714!122,401,27.5042,9.28946,9.41288,0,1,403;                                    405P
        274
715!100,0,0,26.5,12.5,27.5,12.5,26.5,13.5;                                      407P
        275
716!406,3,18,1,0;                                                              409P
        276
717!122,407,27.6212,8.19795,10.2544,0,1,409;                                    411P
        277
718!406,3,10,10,0;                                                             413P
        278
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719!114.6,1.1.4,0.0,1.0,0.0,1.0,2.0,3.0,4.0,-6.10104,-2.99756,                415P
      279
720!1.19845,-0.793964,0.775759,-0.749388,-2.18585,1.45723,0.258302,          415P
      280
721!-1.50204E-05,3.37866,-2.25243,-0.0427499,0.749399,-2.81572,              415P
      281
722!1.87714,19.5412,-1.99829,-9.75513,6.50342,0.528723,-0.499552,            415P
      282
723!-1.32647,0.885036,-0.649134,-2.14577E-05,2.20266,-1.46844,               415P
      283
724!0.108942,0.499579,-1.5727,1.24847,-15.3495,-0.999341,6.89512,            415P
      284
725!-4.59674,0.211907,-0.24981,-0.574285,0.382851,0.546987,                  415P
      285
726!-3.43523E-05,0.980804,-0.653655,-0.0914004,0.249847,-0.911973,           415P
      286
727!0.607975,-5.10972,-2.99756,-0.424453,0.28297,1.16411,1.49878,            415P
      287
728!-3.37567,2.58378,0.130052,2.24818,-5.06849,3.37699,-0.0427448,           415P
      288
729!-0.749396,1.68065,-1.12043,19.5298,-1.99828,-10.7536,7.16909,            415P
      289
730!-0.442719,0.999142,-2.54124,1.69416,-0.322308,1.49871,-3.41542,          415P
      290
731!2.27695,0.10894,-0.499568,1.12475,-0.74984,-14.682,-0.999338,            415P
      291
732!6.38967,-4.25977,1.03168,0.499663,-1.3486,0.399067,0.272784,             415P
      292
733!0.749511,-1.75512,1.17008,-0.0913923,-0.249839,0.58706,                  415P
      293
734!-0.391372,-3.8583,-1.43051E-06,-7.65797,5.12531,1.29598,3.74695,         415P
      294
735!-8.97071,5.98047,1.01854E-03,-7.39098E-06,-0.0265505,0.0177014,          415P
      295
736!-0.0427473,-0.749385,1.68062,-1.12042,18.8737,5.72205E-06,               415P
      296
737!-15.5455,10.3904,-0.760513,2.49786,-3.99781,3.99854,4.51231E-03,         415P
      297
738!8.58307E-06,-0.0411451,0.0274251,0.106937,-0.49958,1.1248,               415P
      298
739!-0.749861,-15.4689,-2.86102E-06,3.873,-2.582,1.30307,1.24917,            415P
      299
740!-3.09767,2.06511,-0.0013926,-4.29153E-06,6.05178E-03,                    415P
      300
741!-4.03547E-03,-0.0913928,-0.249832,0.587027,-0.39135,-2.60325,            415P
      301
742!2.99755,-15.0046,10.0031,1.17136,1.49878,-3.98194,2.65462,               415P
      302
743!-0.126423,-2.24816,5.01532,-3.34355,-0.0427462,0.749386,                 415P
      303
744!-2.81568,1.87712,18.2266,1.9983,-20.4997,13.6665,-0.424678,              415P
      304
745!0.999141,-2.70571,1.80381,0.331523,-1.49873,3.33323,-2.22215,            415P
      305
746!0.108937,0.499589,-1.87269,1.24845,-12.2586,0.99933,1.36842,             415P
      306
747!-0.912277,1.02611,0.499665,-1.32448,0.882988,-0.275569,                  415P
      307
748!-0.749502,1.76714,-1.17609,-0.0913923,0.249832,-0.911943,                415P
      308
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749!0.607962,-1.60104,2.99756,-16.7869,11.1913,0.790295,-0.749389,
      309                                                              415P
750!-2.39352,1.59867,-2.37089,2.24617,7.19497,-4.79662,1.58059,
      310                                                              415P
751!-1.49878,-4.79664,3.19775,18.2422,1.9983,-21.7449,14.4966,
      311                                                              415P
752!0.564777,-0.499552,-1.65733,1.10488,-1.69433,1.49366,4.97199,
      312                                                              415P
753!-3.31454,1.12955,-0.999104,-3.31466,2.20976,-11.5995,0.999324,
      313                                                              415P
754!0.899131,-0.59942,0.200792,-0.249845,-0.526031,0.35069,
      314                                                              415P
755!-0.602377,0.749534,1.57809,-1.05207,0.401585,-0.499689,-1.05206,
      315                                                              415P
756!0.70133,-8.69911,-2.99756,8.99267,-5.99511,-0.70225,-0.749405,
      316                                                              415P
757!2.24321,-1.49881,1.38452,2.57492E-05,-7.72476E-05,5.14984E-05,
      317                                                              415P
758!-0.231931,0.749379,-2.24814,1.49876,14.2912,-1.99828,5.99485,
      318                                                              415P
759!-3.99657,-0.413661,-0.499576,1.49873,-0.999155,0.0850663,
      319                                                              415P
760!-1.93119E-05,5.79357E-05,-3.86238E-05,-0.0157094,0.499585,
      320                                                              415P
761!-1.49876,0.999171,-14.0504,-0.999335,2.99801,-1.99867,-0.229337,
      321                                                              415P
762!-0.249327,0.749482,-0.499655,0.873902,9.29832E-06,-2.7895E-05,
      322                                                              415P
763!1.85966E-05,-0.145551,0.249827,-0.74948,0.499653,-8.24877,
      323                                                              415P
764!-2.99756,8.99267,-5.99511,1.371,1.49878,-4.49635,2.99757,
      324                                                              415P
765!0.688731,2.24816,-6.74449,4.49633,-0.231923,-0.749389,2.24817,
      325                                                              415P
766!-1.49878,13.9469,-1.9983,5.99489,-3.99659,-0.290657,0.99914,
      326                                                              415P
767!-2.99742,1.99828,0.0379381,1.49873,-4.49619,2.99746,-0.0157123,
      327                                                              415P
768!-0.499577,1.49873,-0.999154,-13.5514,-0.999327,2.99798,-1.99865,
      328                                                              415P
769!1.08181,0.499671,-1.49901,0.999342,0.437249,0.749496,-2.24849,
      329                                                              415P
770!1.49899,-0.145543,-0.249835,0.749506,-0.499671,-6.42096,
      330                                                              415P
771!2.86102E-06,-8.58307E-06,5.72205E-06,2.0527,3.74695,-11.2408,
      331                                                              415P
772!7.49389,-0.007038,-4.29153E-06,1.28746E-05,-8.58307E-06,
      332                                                              415P
773!-0.231925,-0.749386,2.24816,-1.49877,13.6785,-2.86102E-06,
      333                                                              415P
774!8.58307E-06,-5.72205E-06,-0.261917,2.49787,-7.49361,4.99574,
      334                                                              415P
775!-9.19914E-03,-6.4373E-06,1.93119E-05,-1.28746E-05,-0.015708,
      335                                                              415P
776!-0.499957,1.49871,-0.999139,-12.1779,5.72205E-06,-1.71661E-05,
      336                                                              415P
777!1.14441E-05,1.51968,1.24916,-3.74746,2.49832,6.19411E-04,
      337                                                              415P
778!-7.15256E-06,2.14577E-05,-1.43051E-05,-0.145547,-0.249827,
      338                                                              415P
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779!0.749462,-0.499055,-4.60722,2.99756,-3.99268,5.99512,1.34265,                415D
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780!1.49873,-4.49634,2.99756,-0.702812,-2.24816,6.74449,-4.49633,                415P
        340
781!-0.231921,0.749381,-2.24814,1.49876,13.3917,1.99829,-5.99487,                415P
        341
782!3.99653,-0.327439,0.999147,-2.99744,1.99829,-0.0563231,-1.49871,             415D
        342
783!4.49512,-2.99742,-0.0157137,0.499564,-1.49869,0.999128,-10.8032,             415P
        343
784!0.99933,-2.99799,1.99866,1.08428,0.499662,-1.49899,0.999324,                 415P
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785!-0.436023,-0.749496,2.24849,-1.49899,-0.145542,0.249832,                     415D
        345
786!-0.749495,0.499663,-4.19911,2.99755,-3.99266,5.99511,-0.758542,              415P
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787!-0.749409,2.24823,-1.49882,2.27562,2.24823,-6.74468,4.49646,                 415P
        347
788!-1.51708,-1.49852,4.49646,-2.99764,12.9922,1.99829,-5.99488,                 415D
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789!3.99659,-0.487227,-0.499578,1.49873,-0.999155,1.46168,1.49873,               415P
        349
790!-4.4962,2.99747,-0.974453,-0.999155,2.99747,-1.99831,-10.3004,               415P
        350
791!0.999527,-2.99796,1.99865,-0.224393,-0.249836,0.749508,                     415D
        351
792!-0.499672,0.673179,0.749508,-2.24852,1.49902,-0.448786,                      415P
        352
793!-0.499672,1.49902,-0.999344,0,1,413;                                        415P
        353
794!110,18.34,13.5331,7.08001,15.7419,8.28305,8.37905;                          417D
        354
795!110,19.5442,12.9354,8.22789,18.34,13.5331,7.08001;                          419P
        355
796!406,3,1,36,0;                                                               421P
        356
797!120,417,419,0,0,6.28319,0,1,421;                                            423D
        357
798!402,4,141,143,145,337;                                                      425P
        358
799!402,7,91,93,95,97,99,101,103;                                               427P
        359
800!406,1,2HD1;                                                                 429D
        360
801!406,1,1;                                                                    431P
        361
802!406,2,150,0,125,0;                                                          433P
        362
803!404,4,87,35,0,35,0,75,35,0,105,0,59,105,0,35,0,45,105,0,105,0,0,            435D
        363
804!0,3,429,431,433;                                                            435P
        364
805!S       1G       3D      436P      364                                      I
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